# DE INSTRUMENTIS PLANETARIIS.

Cui uſui inſerviunt, & quomodo ſunt tractanda.

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# OF THE PLANETARY INSTRUMENTS.

To what end they ſerve, and how they are to be uſed.

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*LONDINI,*
Ex Officina LEYBOURNIANA.
*M. DC. LIX.*

# PLANETARIS.

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Cui usui inserviunt, & quomodo sunt tractanda.

1 *Ad quod Systema Mundi fabricentur, & quibus Planetis accommodentur.*

HÆ Theoricæ ad Hypotheses *Copernicanas* instituuntur, in quibus cum Sol Centrum Mundi possideat, hujus apparentes motus, realiter existunt in terra. Unde hæc loco Solis inter septem Planetas numeratur.

De quinque tantum ex his septem eorumque locis investigandis hic dicemus. Nam Lunæ motus, & passiones quas conjunctim habet cum terra, quia plures reliquis admittit varietates non nisi per instrumentum particulare commode absolvi nequeunt, quare Lunam hic missam facimus.

Rursus locus terræ in his Theoricis non tam sui ipsius quam aliorum Planetarum causa requiritur; quorum loca in Zodiaco deprehendi nequeunt, nisi

# OF THE PLANETARY INSTRUMENTS.

To what end they serve, and how they are to be used.

1 To what Systeme of the world these Theorics are framed & to what planets they serve.

*THese Theorics are framed according to* Copernicus *his Hypothesis: in which the Sun is supposed to be in the Center of the World, and those motions that are apparently in the Sun, to be really in the Earth. And so the earth, in the Suns roome comes to be numbred among the 7 Planets.*

*Of these 7 we shall properly enquire after the places of five onely. For, the perfect absolution of the Moones motion, and passions jointly with the Earth, being of more varieties then the rest, will require an Instrument alone, and so the Moon is dismissed hence.*

*Again, the earths place is required in these Theorics, not so much for it self, as for the other five Planets, whose places in the Zo-*

nisi prius in qua mundi parte terra sit (hoc est nos ipsi simus) dignoscatur. Interim tamen verus terræ locus respectu Ecclipticæ, & per consequens apparens solis, modo requiratur, hic inveniri poterit. Uti postea in octavâ Propositione indicabitur.

*diac cannot be had in respect of us, unlesse we first know in what part or place of the World the earth (that is, our selves upon the earth) do stand. Yet the true place of the earth in respect of the Ecliptick, & consequently the apparent longitude of the Sun, may here likewise be found, when at any time it shall be required, as is shewed afterwards in the 8th Proposition.*

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2 *Quomodo tempus omne calculo accommodetur.*

UT tempus calculo accommodetur hæc sunt observanda.

1 Omnes motus colligendi sunt ad tempora completa.

2 Dies inchoatur in suo meridie completur vero in meridie die sequentis. Ita quod,

3 Meridies primi diei Januarii est terminus communis veteris, & novi Anni: periodus (sc.) præcedentis, & principium Anni sequentis.

2 How all time is to be fitted for computation.

*FOr the accomodation of time to calculation, we may observe these things.*

1 *All motions are to be collected for complete times.*

2 *A day begins upon its own noon, and ends upon the noon of the next day. So that,*

3 *The noon of the first day of January is the common term of the old and new years, being the end of the former and the beginning of the latter.*

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3 *Quid sit locus Planetæ, cum methodo colligendi æquales Anomalias.*

HÆ Theoricæ, uti antea dictum est, præcipuo instituuntur ad expeditam inventionē locorum *Saturni, Jovis, Martis, Veneris*, & *Mercurii*, a cujusque diei meridiem & in formâ quâ nunc sunt ad annum septingen-

tesi-

3 What the place of a Planet is, with the manner of collecting the equal Anomalies.

*THese Theorics (as is said before) do especially concern the 5 Planets*, Saturn, Jupiter, Mars, Venus, & Mercury, *& are intended for the speedy finding out of their places for every day at noon. They will serve as they are*

now

teſimum ſupra milleſimum abſque ſenſibili errore inſervient.

Locus Planetæ eſt ejuſdem ſitus ad planum Eclipticæ reſpectu longitudinis in illâ, latitudiniſque ab eadem. Cui etiam intervallum ſeu diſtantia Planetæ á terra addi poterit.

Ad hæc invenienda primo dignoſcendum eſt quænam tempori dato debeatur Anomalia tam terræ, quam Planetæ cujus locus inquiratur. Hæ vero Anomaliæ ex propriis Tabulis orbitæ cujuſque Planetæ annexis excerpenda. Numerique Tabulares pro gradibus graduumque partibus centeſimis æſtimandi ſunt.

*His præmiſſis modus colligendi æquales Anomalias hujuſmodi eſt.*

Primo, Exſcribe Epocham anni proxim præcedentis.

2 Sub iſta Epochâ, ſeu numero ſcribe motus competentes tot annis, menſibus, & diebus quot ab anno Epochæ completis ſint, hi ex propriis Tabulis ſunt ſigillatim ſumendi, & invicem ordinatim ſubjicendi: quod ut fiat numerorum diſunctio ſatis docebit.

3 Horum

*now framed, till the year* 1700 *without any notable alteration.*

*The place of a Planet is the ſituation of it to the plain of the Ecliptick, in reſpect of longitude therein, and latitude therefrom. To which alſo may be added the interval or diſtance of it from the Earth.*

*To find theſe things, we muſt firſt know, what Anomaly is due, for the time aſſigned, both to the earth, and likewiſe to the Planet whoſe place is required. Theſe are ſeverally to be gathered out of their proper Tables, annexed to every Planets Orbit. And the numbers in thoſe Tables are to be eſteemed for degrees and centeſimal parts of degrees.*

The manner of collecting the equal Anomalies is this.

*Firſt, Exſcribe the Epocha which belongs to that year, wch moſt neerly precedeth the year wherein you ſeeke the place of any Planet.*

2 *Under that Epocha or number, write the motions belonging to ſo many years, moneths, and dayes, as are completely expired ſince the year of the Epocha. Each of theſe numbers muſt be taken out of their proper Tables, & ſet orderly one under another which the disjunction of the numbers will give direction enough to doe.*

3 *All*

3 Horum aggregatum dabit Anomaliam quæsitam, sin vero excedat circulum seu 360 gr. integer circulus quoties poterit rejiciendus est, & residuum sumendum pro Anomalia.

Hæc tam pro terra quam Planeta sigillatim facienda sunt. Qua de causa Anomaliæ terrestris Tabula bis repetitur, ut scilicet in quaque lamia semel in promptu sit, pro singulari instrumenti faciebus quæcunque illarum in usum venerit, & sine qua nec Planetæ locus, nec passiones aliquot quibus subjicitur inveniri possunt.

*Sequitur jam*

1 Longitudinem Planetæ in Ecliptica investigare,

2 Latitudinem ab Ecliptica investigare.

Huc rei centro instrumenti, hoc est centro Solis filum appendendum est. Insuper comparanda est tenuis e metallo regula cum linea fiduciali ejusdem (aut circiter) longitudinis cujus est diametrus instrumenti. Quæ solute sit oportet & mobilis nullo modo alligata, sed datis duobus quibuslibet instrumenti punctis applicabilis.

4 Cujus-

3 *All these numbers must be added into one, and their summe shall give the Anomaly for the time assigned. If the sum rise to be above a Circle or 360 d. you must then cast away the said number of 360 as oft as you may, and the remaining number must be taken for the Anomaly.*

*These thinges are to be done both in the Earth and Planet severally. And for that purpose the Table of the Earths Anomaly is twice set down upon each plate once; that which soever of the plates you are to use, you may have the earths Table at hand: without which neither the Planets place, nor some of the passions thereto belonging can be found. Now it follows to be shewed,*

1 *How to find the Longitude of a Planet in the Ecliptic.*

2 *How to find the Latitude of a Planet from the Ecliptic.*

*And for this purpose you must have a thread fixed to the Center of your plate, which is the Center of the Sun. And besides, there must be a thin plate-ruler, with a streight or fiducial edge, of such length as may be neer about the Diameters of the plates. It must not at all be fastened to them, but be separate and loose, that it may be applyed to any two points prescribed upon the superficies of the plates.*

4 How

4 *Cujuſlibet e quinque Planetis longitudinem invenire.*

1 COllige Anomalias tam terræ, quam Planetæ cujus Longitudo inquiritur ex propriis Tabulis, uti antea præceptum eſt.

2 Numera Anomaliam Planetæ in Orbita ipſius, Anomaliam terræ ſuper illam terræ Orbitam quæ in eadem inſtrumenti facie, qua etiam eſt Planetæ Theorica deſcribitur. Hæc duo puncta obſerva nam in illis erit & Planetæ & terræ locus pro dato tempore.

3 His punctis lineam regulæ fiducialem ita applicabis ut eadem regulæ linea, & Solem reſpiciat, & limbum ſeu Zodiacum ſecet, vel prætergrediatur, prout ratio poſtulet, & diſponatur major ejus portio á terra verſus Planetam, ſæpius enim ad operationes ſequentes illud requiretur.

4 Per circinum cape minimam diſtantiam inter Centrum Solis, & lineam regulæ fiducialem, & invariatâ aperturâ fige pedem unam ſuper aliquem Zodiaci exterioris ſive limbi gradum in eodem regulæ latere in quo erat Solis Centrum, & verſus eam Zodiaci plagam

4 How to find the longitude of any of the 5 Planets.

1 *GAther the Anomalies of the Earth and of the Planet whoſe longitude is required, each out of their own proper Tables: in ſuch manner as was before ſhewed.*

2 *Count the Planets Anomaly upon the Planets Orbit, & the Earths Anomaly upon that Orbit of the earth which is drawn upon the ſame ſide of the plate with the courſe of your Planet, and obſerve theſe two points, for in them are the places of the earth and Planet, for the time aſſigned.*

3 *To both theſe points, apply the fiducial edge of your little plate-ruler, ſo, as that the ſame edge may look towards the Sun, and that it may alſo cut the limbe or Zodiac, and goe beyond it as occaſion ſhall be: and let the greateſt part of it lye from the earth towards the planet, for many times it will be requiſite ſo to lay it, becauſe of the work that next follows.*

4 *Meaſure with your Compaſſes the leaſt diſtance between the Center of the Sun and the fiducial edge of the ſame ruler: and ſet one foot of this diſtance upon any part on the exteriour limbe or Zodiac of the plate, & on the ſame ſide of the ruler that the Suns Center is, and on that part*

plagam quæ à terra verſus Planetam reſpicit. Quæ omnia ita dirigenda ſunt ut alter pes circini lineam regulæ fiducialem tangat. Tunc enim pes iſte ſuper Zodiacam poſitus oſtendet Planetæ Longitudinem in ſignis & partibus ejus.

*Videas exempla poſt præceptum ſequens.*

*part of the Zodiac which is from the Earth towards the Planet. All this muſt be done in ſuch wiſe, that the other foot of the Compaſſes being turned about may juſtly touch the edge of the ruler. In this poſture, that foot which ſtandeth upon the Zodiac will there ſhew the ſigne and degrees of the Planets longitude.*

See examples after the next Precept.

5 *Cujuſlibet è 5 Planetis Latitudinem inveſtigare.*

1 COgnitis Anomaliis tam terræ quam Planetæ, applica filum Centro affixum Anomaliæ Planetæ in ſuâ Orbitâ numeratæ, & immoto filo cape minimam diſtantiam inter illud & iſtum Planetæ characterem (cujus locum inquiris) filo magis commodum, nam uterque aptus non erit: Et obſerva utrum filum Borealem an Auſtralem inclinationem ſecuerit.

2 Metire iſtam diſtantiam in Scala pro inclinationibus Planetæ, facta & ei circinus inclinationem oſtendet (plaga vero antea detecta eſt.)

5 How to find the Latitude of any of the 5 Planets.

1 *HAving found the Anomalies of the Earth and Planet, lay the threed that is fixed at the center upon the Planets Anomaly numbred in its proper Orbit. And to the threed ſo laid, take the leaſt diſtance from that character of the Planet (whoſe place you ſeeke) that lyes fitted to the threed, for both will not: and obſerve whether the threed cut through the title of North or South inclination.*

2 *Meaſure the ſame leaſt diſtance, upon that Scale which is made for the meaſure of the Planets inclination, and upon that Scale the Compaſſes will ſhew how much the inclination is: the coaſt or title of it being diſcovered before.*

3 Reſtant adhuc duæ diſtantiæ menſurandæ. Prima, eſt diſtantia Planetæ a terrâ, hoc eſt à punctis Anomaliarum quæ ſunt loca eorum in ipſorum Orbitis. Secunda, eſt Planetæ à ſole. Quæ fiunt applicando diſtantias in circino captas Scalæ huic rei factæ Scalæ (ſc.) Decimali quæ in ſingulis Theoricis grad. 360 ſive exterioris Planetæ punctum Aphelium ſecat. Hoc pacto diſtantias ipſas, vel ſaltem earum proportionem dignoſces.

4 Adi Scalam in partes 120 æquales diviſam cum arcu graduationum ſibi appendente, & ſuper iſtum arcum numera Planetæ inclinationem prius inventam cui filum applica. Deinde ſuper eandem Scalam numera Planetæ diſtantiam a Sole, & minimum abinde ad filum ſpatium per circinum cape, & ſerva. Denuo in eadem Scalâ Planetæ à terra diſtantiam nota, & circini pedem alteram iſtic fige. Filum verum ita move ut pes circini alter converſus invariata apertura filum exacte tangat. Sic demum filum ſuper arcum appendentem oſtendet Planetæ latitudinem quæſitam. Quæ ſemper ejuſdem erit denomina-

3 *You are then to meaſure two diſtances more. The firſt, is from the Planet to the earth, that is, from the points of their Anomalyes, which are their places in their Orbits. The ſecond, is from the Planet to the Sun. And theſe are done, by taking the ſaid diſtances in your compaſſes, and applying thoſe lengths to the Scale appointed for that purpoſe [namely that Decimal Scale, which on every Theoric paſſeth through 360, or the Aphelial point of the exteriour Planet.] By this meanes you ſhall know their diſtances, or the proportion of them at leaſt.*

4 *Next, goe to the equal Scale divided into* 120, *which hath an ark of graduations appendent to it. And upon that ark, Count the inclination of the Planet, which you found before, and thereto lay the threed. Afterwards, upon the Scale of* 120 *count the number of the Planets diſtance from the Sun, and take the leaſt extent from that number to the threed, keeping it ſtill in your compaſſes. Then again, upon the ſame Scale, count the diſtance of the Planet from the Earth, and there ſet one foot of the former extent, and apply the threed to the other foot, ſo, that the ſaid other foot being turned about, may onely reach*

nationis cujus est inclinatio prius inventa.

Duo plenissima Exempla hic sequuntur. Longitudinis, Latitudinis, Distantiæque terræ reliquorumque 5 Planetarum. Unum ad quartum Octobris 1649 in Meridie. Alterum ad 19 Feb. 1651 in Meridie.

*the threed neither going beyond, nor falling short of it. So the threed, in this position, will shew upon the appendent arke the quantity of the Planets latitude. And for the coast or denomination of the Latitude it must alwayes be the same that the Inclination was, whether North or South.*

*See two examples at large here following for the Longit. Latit. and Dist. of the earth and the other 5 Planets. One Example is for the 4th of October at noon 1649. The other is for the 19th of February at noon, 1651.*

Locus Terræ reliquorumque 5 Planetarum ad quartum Octobris in merid. 1649.

*The Places of the Earth and the other 5 Planets, Octob. 4th. at noon. 1649.*

| | Earth | ♄ | ♅ | ♂ | ♀ | ☿ | |
|---|---|---|---|---|---|---|---|
| Epocha 1644 | 194 80 | 119 90 | 229 28 | 299 78 | 238 78 | 61 55 | *Epocha 1644* |
| Motus in 4 annis | 359 96 | 48 86 | 121 40 | 45 59 | 180 69 | 218 86 | *Motion in 4 years* |
| Sept. compl. an. com. | 269 07 | 9 13 | 22 68 | 143 06 | 77 38 | 37 20 | *Sept. compl. com. year* |
| Octob. dies 3 compl. | 2 96 | 0 10 | 0 25 | 1 37 | 4 81 | 12 28 | *Octob. 3 dayes complete* |
| Summa | 826 79 | 177 99 | 373 61 | 489 80 | 501 66 | 329 89 | *Summe* |
| Circuli subtrahendi | 720 | | 360 | 360 | 360 | | *Circles subtracted* |
| Anomaliæ æquales | 106 79 | 177 99 | 13 61 | 129 80 | 141 66 | 329 89 | *The equal Anomalyes* |
| Planetarum longit. | ♈ 21 45 | ♋ 1 20 | ♎ 20 20 | ♐ 4 00′ | ♏ 7 15′ | ♍ 2 00′ | *The Planets Longitudes* |
| Inclinationes | | *aust.* 1 12′ | *bor.* 1 18′ | *aust.* 1 15′ | 10 .045′ | *aust.* 1 15′ | *Inclination* |
| Distantiæ à Sole | 68 | 77½ | 93⅓ | 50 | 49½ | 31⅓ | *Distances from the Sunne* |
| Distantiæ à Terra | | 74 | 110 | 69 | 62⅓ | 95½ | *Distances from the Earth* |
| Planetarum Latitud. | | *aust.* 1 15′ | *bor.* 1 07′ | *aust.* 100′ | *bor.* 0 37′ | *aust.* 0 25′ | *The Planets Latitudes* |

Locus Terræ reliquorumque 5 Planetarum ad 19 Feb. in Meridie 1651.

*The places of the Earth and the other 5 Planets upon the 19th of Febr. at noon. 1651*

| | Earth | ♄ | ♅ | ♂ | ♀ | ☿ | |
|---|---|---|---|---|---|---|---|
| Epocha 1644 | 194 80 | 119 90 | 229 28 | 299 78 | 238 78 | 61 55 | *Epocha, 1644* |
| Motus in sex annis | 359 45 | 73 27 | 182 06 | 68 13 | 270 23 | 326 24 | *Motion in 6 years* |
| Janu. compl. an. com. | 30 55 | 1 04 | 2 58 | 16 24 | 49 67 | 126 86 | *Janu. complete com. year* |
| Febr. dies 18 compl. | 17 74 | 0 60 | 1 50 | 9 43 | 28 84 | 73 66 | *Febru. 18 dayes complete* |
| Summa | 602 54 | 194 81 | 415 42 | 393 58 | 87 52 | 588 31 | *Summe* |
| Circuli subtrah. | 360 | | 360 | 360 | 360 | 360 | *Circles subtracted* |
| Anomaliæ æquales | 242 54 | 194 81 | 55 24 | 33 58 | 227 52 | 228 31 | *The equal Anomalyes* |
| Planetarum Long. | ♒ 11 30′ | ♋ 8 20′ | ♐ 9 50′ | ♎ 21 20′ | ♒ 18 00′ | ♓ 20 20′ | *The Planets longitudes* |
| Inclinatio | | *aust.* 0 22′ | *bor.* 0 49′ | *bor* 1 25′ | *bor.* 3 20′ | *bor.* 6 45′ | *Inclination* |
| Distantiæ à Sole | 67 | 77¼ | 91¼ | 55⅔ | 49⅓ | 23 ¾ | *Distance from the Sunne* |
| Distantiæ à Terra | | 73 | 90⅔ | 27 | 20¾ | 45 ¼ | *Distance from the Earth* |
| Planetarum Latitud. | | *Aust* 0 24′ | *Bor.* 0 50′ | *Bor.* 3 00′ | *Bor.* 7 45′ | *Bor.* 3 34′ | *The Planets Latitudes* |

6 *Quot Semidiametris terræ Planeta quiſpiam diſtabit à Sole, vel Terra dignoſcere.*

MEnſuratis prius diſtantiis Planetæ à Terrâ, & Sole in Scalis propriis ut ante præceptum eſt

Pro ♄ ♃ ♂ ♀ ☿ } Duc diſtantias in { 400 200 100 50 50 } Factum erit inter vallum quæſitum in Semidiametris Terræ.

In acquirendâ diſtantia Terræ & Sole majori opus eſt cautelâ: attamen eodem pariter modo inveſtigatur.

Theoricæ huic rei magis idoneæ ſunt iſtæ *Veneris*, *Mercurii*, aut *Martis*, ſi diſtantia Terræ à Sole menſuretur in Theorica *Veneris*, aut *Mercurii*, numerus inventus per Scalam iſtius laminis ducendus eſt in 50 numerum (ſcil.) *Veneris*, & *Mercurii*, ſin vero in Theorica *Martis* ducatur in 100 *Marti* propriam.

6 To know how many Semidiameters of the Earth any Planet at any time is diſtant from the Earth, or from the Sun.

*HAving meaſured the diſtances of the Planet from the Earth and from the Sun, upon its proper Scale, as was ſhewed before; Then*

*For* ♄ ♃ ♂ ♀ ☿ } *Multiply the ſaid diſtances by* { 400 200 100 50 50 } *And the product will be the required interval in Semidiameters of the Earth.*

*The Earths diſtance alſo from the Sun may be had in the ſame manner, but with a little more caution. For the fitteſt Theorics for this work are thoſe of* Venus, *and* Mercury, *or elſe* Mars. *If you take the Earths diſtance from the Sun upon the plate of* Venus, *and* Mercury, *then you muſt multiply the number found by the Scale of that plate, by* 50, *which is the number given before for* Venus, *and* Mercury. *But if you take it from the Theoric of* Mars, *then you muſt multiply the number there found, by* 100, *which is the multiplying number given before for* Mars.

*Sic juxta Exemplum primum hæ invenientur distantiæ.*

So according to the first Example these Distances will be found.

| | | ♄ | ♃ | ♂ | ♀ | ☿ | Earth | |
|---|---|---|---|---|---|---|---|---|
| *Distantiæ Planetarum in Scalis propriis à* | *Sole* | 77 1/3 duc in mult. by 400 | 93 1/3 *in* 200 | 50 *in* 100 | 49 1/2 *in* 50 | 31 1/2 *in* 50 | 68 | The Plan. dist. in their proper Scales, from the Sunne |
| | *Terra* | 74 | 110 | 69 | 62 1/2 | 95 1/2 | | Earth |
| *Distantiæ in Semidiametris Terræ à* | *Sole* | 31000 | 18700 | 5000 | 2475 | 1575 | 3400 | Their distances in Semid. of the Earth, from the Sunne |
| | *Terra* | 29600 | 22000 | 6900 | 3116 | 4775 | | Earth |

*Juxta secundum Exemplum hæ Semidiametri exurgent.*

According to the second Example these numbers of Semidiameters will rise.

| | | ♄ | ♃ | ♂ | ♀ | ☿ | Earth | |
|---|---|---|---|---|---|---|---|---|
| *Distantiæ Planetarum in Scalis propriis, à* | *Sole* | 77 1/4 | 91 1/4 | 55 2/3 | 49 1/3 | 23 3/4 | 67 | The Plan. dist. in their proper Scales, from the Sunne |
| | *Terra* | 73 | 90 2/3 | 27 | 20 3/4 | 45 | | Earth |
| *Distantiæ in Semidiametris Terræ à* | *Sole* | 31100 | 18250 | 5567 | 2467 | 1187 | 3350 | Their distances in Semid. of the Earth, from the Sunne |
| | *Terra* | 29200 | 18133 | 2700 | 1037 | 2250 | | Earth |

## 7 *Ex Planetæ Longitudine & Latitudine datis rectam ascensionem & declinationem invenire.*

## 7 By the Longitude & Latitude of a Planet being known, how to find the right ascension & declination thereto belonging.

COmmodissimè hæc fiunt per Astrolabia, aut instrumenta istiusmodi Spherica. Ad supplendum autem hunc defectum Scalas addidi quibus licet majori cum molestiâ, ista perficiantur. Huic rei delineationes in Theoricis *Saturni* & *Jovis* bis repetitæ inserviunt, ut unaquæque lamina suam habeat Scalam istis Theoricis quæ super illâ ducuntur paratam.

*THis work is most proper for Astrolabes, and other such Spherical instruments. Yet because these Theorics should not be altogether defective herein, I have added such Scales as will perform these things, though it be with more trouble. For this purpose those Delineations upon the two Theorics of* Saturn & Jupiter *are added; both which are the same thing done twice over, that each plate may have one ready at hand, for those Planets which are drawn upon it.*

¶ Primo, igitur inquirenda est ascensio recta istius puncti Eclip-

¶ *The first thing to be done is, to get the right ascension of the*

Eclipticæ quod longitudini Planetæ reſpondet, quaſi Latitudis eſſet expers. Quod perficitur in ſcala aſcenſionum rectarum partium Eclipticæ. Quæ ex inſpectione tituli dignoſci poteſt.

Numera igitur in Zodiaco Elliptico Planetæ Longitudinem, id eſt, ſignum & gradum ubi per quartum præcedens inventus fuerit, & ibi applicato filo centrali obſerva ubi arcum ſecuerit notatum 1,2,3. Qui in gradibus graduumque partibus æſtimatus oſtendit differentiam Longitudinis ab aſcenſione recta, & proinde appellari poteſt *Longitudinis æquatio*. Hæc æquatio Longitudini antea inventæ vel addenda eſt, vel ſubtrahenda prout filum oſtenderit cadens in titulos Additivos, vel Subtractivos pone hunc differentialem arcum ſcriptos. Hoc cite facto prout oportet, ſumma vel differentia inventa erit aſcenſio recta meræ Longitudinis Planetæ. Quod primum erat requiſitum.

Hoc modo abſque ulteriori

*the meer longitude of the Planet, as if it were without all Latitude, or in that very point of the Ecliptic which anſwers to the Longitude. And this is performed upon that Syſteme of Scales which is made for the finding out of the right aſcenſions of the parts of the Ecliptic, as in the title thereof is expreſſed, by which title it may alſo be known.*

*Count therefore upon the Elliptical Zodiac, the Planets Longitude, that is, the ſigne & degree, in which you found it by the 4th precedent: and thereto applying the Center threed, obſerve where the ſame threed cuts the ark noted with* 1, 2, 3, *the ſame ark being eſtimated in degrees & minutes, is that which ſhews how much the Longitude differs from the right aſcenſion, which may be called,* the longitude Equation. *This Equation or difference muſt either be added to, or ſubtracted from, the Longit. before found, according as the threed will intimate by falling upon the directions for addition or ſubtraction, written cloſely behind this differential ark. And this being accordingly done the ſum or difference ſo found, ſhall be the right aſcenſion of the Planets meer Longitude, which was the firſt thing required.*

*And thus much alone doth*

get

ri labore acquiruntur aſcenſiones rectæ vel Solis, vel Terræ, quia latitud. expertes ſemper verſentur in plano Eclipticæ.

¶ Secundo hæc aſcenſio recta corrigenda eſt juxta Latitudinem Planetæ ab Ecliptica modo aliquam (quod frequentiſſime accidit) habuerit. Et huic rei maxima pars alterius Syſtematis Scalarum inſervit. Hoc modo.

Super duodecim ſignis juxta ordinem quo in Ellipſi inſcribuntur (quæ ſignis in exteriori Zodiaco reſpondent licet characteres aliter ſignentur) & ſuper gradus exterioris Zodiaci (cujus gr. 30 antedictis ſignis per integram Scalam reſpondent) numera Planetæ Longitudinem, & filum applica. Deinde in Scalâ lineæ mediæ quæ Centrum petit, Planetæ latitudinemnu mera. A quo puncto ad filum cape per circinum minimam diſtantiam; hæc minima diſtantia applicata Scalæ lineæ mediæ a Centro exteriùs, æquationem exhibebit in gradibus & minutis. Sit hæc *Latitudinis æquatio.* Quæ aſcenſioni prius inventæ addi vel ab eadem ſubtrahi debet juxta titulos in Ellipſi notatos Hæc ſumma aut differentia ſic ultimo inventa erit exacta aſcenſio recta

*get the true right aſcenſion for the Earth or Sun, becauſe they lye in the plaine of the Ecliptic & have no latitude from it.*

¶ *The ſecond thing to be done, is to correct this foregoing right aſcenſion, which correction muſt alwayes be made when the Planet hath any Latitude from the Ecliptic, as moſt commonly it hath. And for the effecting of this, The greateſt part of the other Syſteme of Scales is to be uſed, and in this manner.*

*Upon the* 12 *ſignes as they are ordered and inſcribed into the Ellipſis (which ſignes do anſwer to thoſe in the exteriour Zodiac, though the characteringe of them be different) and upon the degrees of the exteriour Zodiac (*30 *of which deg. quite through that Scale do anſwer to theſe forementioned ſignes) count the Planets Longitude, and thereto apply the threed. Then again, upon the Scale of the middle line that goes to the Center, count the Planets Latitude; & from that point to the threed, take the leaſt diſtance with your Compaſſes. This leaſt diſtance applyed to the ſame Scale of the middle line, from the Center outwards, will give the equation in degr. and min. This may be* the latitude equation. *And it muſt be either added or ſubtracted from that right aſcenſion*

recta Planetæ pro Longitudine, & Latitudine datis.

¶ Ad declinationem Planetæ acquirendam Zodiaco tantum utimur exteriori cum arcu circulari utrinque ad 25 gr. numerato. Hoc modo.

Numera Planetæ latitudinem in arcu 25 grad. latitudini Planetæ pro eo tempore quoad plagam congruo, & illuc filum porrige. Deinde in Zodiaco exteriori (juxta ordinem signorum & graduum illic numeratorum) numera longitudinem Planetæ: in quo puncto fige circini pedem alterum; altero vero cape minimam distantiam a filo: illud observans utrum in hâc operatione circinus supra vel infra filum steterit. Minima hæc distantia applicetur lineæ rectæ 35 partium ab initio Scalæ procedendo & ostendet declinationem quæsitam. Plagam vero Septent. vel Austral. situs circini infra vel supra filum ostendet. Nam superior situs Borealem inferior plagam Meridionalem denotat. Et ut hæc directio semper

*sion that was found before, according as the Directions that are written upon the Ellipsis shall prescribe.*

*By which meanes, the last sum or difference thus found, shall be the perfect right ascension of the Planet, agreeable to the Longit. and Latit. given. This for the right ascension.*

¶ *For the Planets declination, you are to make use onely of the exteriour Zodiac, and the circular ark numbred both wayes to 25 d. The way is this. Count the latitude of the Planet upon one of the arks of 25 deg. namely that wch is noted with the same kind of latitude that the Planet at that time hath, & thereto apply the threed. Then upon the exteriour Zodiac (according to the order of the signes and degr. as they are there set on) rekon the Planets longitude; & setting one foot of your compasses in that point, with the other foot take the least distance to the threed, observing whether your compasses in this work do stand above or below the threed. This least distance being so take must be applyed to the right line of 35 parts, from the beginning forwards upon the Scale, where it will shew you the quantity of the Planets declinatiõ. And for the coast of this Declination, whether it be North or South, the former observation of the stand-*

per presto sit utrisque exterioris Zodiaci terminis inscribitur.

Terræ sive Solis declinatio nullâ molestiâ invenitur applicando Scalæ 35 longitudini ab *Ariete* vel *Libra* in exteriori Zodiaco recto.

Sequitur Exemplum Ascensionis rectæ, & Declinationis Terræ reliquorumque Planetarum juxta Longitudines Latitudinesque in prioribus Exemplis inventas, & ad Meridiem quarti diei Octobris 1649 computatum.

*standing of the compasses, either above or below the threed, will resolve. For if the compasses do stand above the threed, then the declination is North: if they stand below, then the declination is South. And this direction also, that it might be alwayes neer at hand, is written at both ends of the exteriour Zodiac.*

*The Earth or Suns declin. is had, by taking the length from* Aries *or* Libra *in the exteriour streight Zodiac, and applying it to the Scale of* 35, *for it will there give the declination without more adoe.*

*Here follows an Example of the right ascensions & declinations of the Earth and the other 5 planets, according to the Long. & Latit. of them, found in the first of the two former Examples computed for the fourth day of October at Noon,* 1649.

Ascensiones Rectæ, & Declinationes Planetarum juxta Longit. & Latit. Exempli primi.

*The Right ascens. and declin. of the Planets according to their Long. & Lat. in the* 1 *Example.*

| | Earth | ♄ | ♃ | ♂ | ♀ | ☿ | |
|---|---|---|---|---|---|---|---|
| Longit. solut. in gr. & m. | 21 45′ | 91 20′ | 200 20′ | 244 00′ | 157 15′ | 212 00′ | *Long. resol. into d. & m* |
| Long. æquat. cum titulis Addit. & Subtractivis. | 1 37 *subtr.* | 0 07 *adde* | 1 34 *subtr.* | 2 00 *subtr.* | 1 45 *adde* | 2 12 *subtr.* | *Longitudes æquat. with titles Ad. Subt.* |
| Asc. R. simplicis Longit. | 20 08 | 91 27 | 198 46 | 242 00 | 159 00 | 209 48 | *R. Asc. of meer Long.* |
| Latitudinis æquatio cum titulis Add. Subtract. | | 0 04 *subtr.* | 0 32 *adde* | 0 15 *subtr.* | 0 15 *adde* | 0 12 *subtr.* | *Latitudes equat. with titles of Ad. Subtr.* |
| Ascens. R. absolut. | 20 08 | 91 23 | 199 18 | 241 45 | 159 15 | 209 36 | *Right ascens. absolute* |
| Declinationes | *Bor* 8 15 | *B.* 22 00 | *A.* 6 45 | *A* 21 45 | *B.* 9 30 | *A.* 12 20 | *Declination.* |

8 Inve-

8 *Invenire locum Solis vel Terræ in Eclipticâ.*

HOc faciliùs fit pro Terra quàm pro reliquis 5 Planetis, quia Terra & Latitudinis & commutationis eſt expers, & ad inveniendum verum locum Terræ in Eclipticâ commodius utemur majori Theoricâ : illâ (ſc.) quæ comprehendit *Venerum* & *Mercurium* unâ parte, vel illâ alterâ quæ comprehenditur à *Marte* ex altera inſtrumenti facie.

In Orbitâ Terræ numera Anomaliam ad datum tempus inventam, & ad hunc terminum filum extende quod in exteriori Zodiaco locum terræ deſignabit, cujus oppoſitum eſt locus Solis.

Sic habes in duobus prioribus exemplis locum Terræ ad datum tempus, *viz.* *Aries* 21 gr. 45 m. & *Virgo* 11 gr. 30 m. quorum oppoſitam ſunt 5 loca Solis *viz.* *Libra* 21 gr. 45 m. & *Piſces* 11 gr. 30. m.

9 *De*

8 How to find the place of the Earth or Sun in the Ecliptic.

*THis is much more eaſie to be done for the Earth then it was for the other 5 Planets; becauſe the earths place is free both from commutatiõ & Latit. And for the finding of the true place in the Ecliptic, it will be beſt to uſe the earths largeſt Theorics : namely, either that which comprehends* Venus *&* Mercury *upon one Table, or elſe that which is comprehended by* Mars *upon the other Table.*

*Having therefore found the earths Anomaly for the aſſigned time, Count the ſame upon the Orbit of the earth, and thereto lay the center-threed, which being ſo laid, will give the place of the earth, in the degrees of the exteriour Zodiac. And the oppoſite thereto, is the place of the Sun.*

*In the two former examples you have the earths places (for thoſe aſſigned times) expreſſed by the ſigne and degree, wherein it then ſhall be : namely* Aries 21 *d.* 45 *m. and* Virgo 11 *d.* 30 *m. And the oppoſites to theſe are the places of the Sun at thoſe times : that is,* Libra 21 *d.* 45 *min. and* Piſces 11 *d.* 30 *m.*

9 *De præcipuis nonnullis Planetarum paſſionibus.*

PRincipium harum Theoricarum officium eſt ut per illas inveniantur loca Planetarum quoad longitudinem & latitudinem : quod quia jam antea tractavimus operæ prætium erit de præcipuis eorum paſſionibus pauca addere. Quarum tria præcipuè ſunt capita.

1 Planetæ (ob motum longitudinis quem faciunt in Eclipticâ) nonnunquam videntur ſecundum ſeriem ſignorum procedere (hoc eſt) 1 Directi ſunt in Motu. Aliquando videntur retrocedere (i.e.) ſunt 2 Retrogradi. Et in illorum tranſmutationibus inter utrunque horum motuum neceſſario videbuntur ſtare hoc eſt ſunt 3 Stationarii.

2 Loca Planetarum conſiderantur vel quoad diſtantiam à Sole, vel ab invicem ; unde varios habent aſpectus. Quorum 1 conjunctio dicitur quando duo quilibet Planetæ ſunt in eodem gradu longitudinis. 2 Oppoſite quando ſunt in oppoſita longitudine. 3 Trinus quando $\frac{1}{3}$ circuli vel

9 Concerning ſome of the principal paſſions of the Planets.

THe *finding out of the places of the* 5 *Planets in reſpect of Longit. and Latit. is the thing principally intended in theſe Theorics. Now this having been already declared, it ſhall not be amiſſe to adde ſomewhat of the principal paſſions belonging unto them: of which there are theſe* 3 *chief heads.*

1 *At ſome times theſe* 5 *Planets (in reſpect of that motion which they make according to the longit. of the Ecliptic) doe appeare to goe forward, agreeably to the order & ſucceſſion of the ſignes, that is, they appeare to be* 1 *Direct in motion. Sometimes againe they ſeeme to goe backward in motion, or to be* 2 *Retrograde. And in their changes from the one of theſe motions to the other, they muſt neceſſarily appeare to be ſtanding ſtill, or to be* 3 *Stationary.*

2 *Their places being compared in reſpect of diſtance from the Sun, or one from the other, the Planets may have ſeveral aſpects: as* 1 *Conjunction, when they are (any two of them) in one place of longit.* 2 *Oppoſition, when they are in oppoſite longit.* 3 *Trine, when they are* $\frac{1}{3}$ *part of a circle or* 4 *ſignes diſtant*

vel quatuor ſignis, 4 Quartilis quando 3 ſignis vel circuli quadrante, 5 Sextilis quando ſextâ parte circuli vel duobus ſignis ab invicem diſtabunt. *Venus*, & *Mercurius* nunquam hos aſpectus præter conjunctionem habent ad Solem nec inter ſe invicem ullum faciunt præter ſextilem quo ſæpius diſtant.

3 Locis eorum ad Solem comparatis, vel ſunt ſub radiis, & dicuntur combuſti. Vel poſt ortum Solis interdiu oriuntur, & vocantur Orientales: aut poſt Solis occaſum ſeu noctu occidunt, & ſunt Occidentales: vel Soli ſunt oppoſiti, & dicuntur Acronychi. *Venus* & *Mercurius* nunquam ſunt Acronychi, quia *Venus* nunquam à Sole ultrà 48 gr. *Mercurius* ultrà 29 gr. recedit.

*diſtant from each other*: 4 *Quartile, when they are three ſignes or a quadrant of a circle diſtant*: 5 *Sextile, when they are* $\frac{1}{6}$ *part of a circle or two ſignes diſtant.* Venus *and* Mercury *cannot make any of theſe Aſpects with the Sun. And one of them with the other can make none but the Sextile; which often they doe.*

3 *Their places being compared with the Suns place, they are either under the Sun beames & are thē ſaid to be* 1 *Combuſt: or elſe they riſe after the Sun, riſing when the Sun is up; and are called* 2 *Oriental: or they ſet after the Sun, while the Sun is down, and are called* 3 *Occidētal: or are oppoſite to the Sun; and are called* 4 *Acronychal.* Venus *and* Mercury *can never be Acronychal, becauſe they never goe farre enough from the Sun:* Venus *onely* 48 *d.* Mercurius *onely* 29 *degrees.*

## 10 *De Directione, Retrogradatione, & Statione.*

CUm inventio juſti temporis harum mutationum in Planetarum curſibus res ſit per ſe difficilis; per has Theoricas vix accuratè detegentur. Modus optimus eſt (cognitis prius locis ad diem certum) pro 5 aut decimo poſt die eorum lon-

## 10 Of Direction, Retrogradation, and Station.

THeſe *things will not well be diſcovered by theſe Theorics, it being a difficult buſineſs to ſet the juſt times of theſe changes in their courſes. If you deſire to know in which of theſe motions any Planet is, the beſt way will be (when you have*

longitudines inquirere. Præſertim in *Saturno Jove* & *Marte* quia verò motus *Veneris* & *Mercurii* velociores ſunt ſufficiet eorum longitudines ad ſecundum aut quartum poſt diem inveſtigare. Quo pacto exploratis eorum longitudinibus ad duo tempora diverſa quem curiam teneant ratione progreſſioni, regreſſionis, aut ſtationis facile perceperis.

Sic ſi ad priùs Exemplum loca ad aliquot ſequentes diei examinaveris, erunt omnium motus juxta ſeriem ſignorum directi, in poſteriori omnes excepto *Jove* retrogradi, cujus etiam locus invenietur parum diſtans à priori in præcedentia tunc primam intracturus ſtationem.

Nam illud ſemper eſt notandum quod ſi Planeta directio tranſiverit ad ſtationem iſta dicitur prima ſtatio: quando vero à retrogrado motu, iſta ſtatio ſecunda nuncupatur.

*found their places for any one day) to enquire their longitudes about 5 or 10 dayes after in* Saturn, Jupiter *and* Mars, *or about 2 or 4 dayes after for* Venus *and* Mercurius, *becauſe the motions of theſe are much ſwifter then of the other. And ſo having found their places of longitude at two ſeveral times, you ſhall perceive what courſe they hold in reſpect of progreſſe or regreſſe of ſtanding ſtill.*

*So if in the firſt Example the places were again examined for ſome other dayes after, they would all be found direct in their motions according to the ſucceſſion of the 12 ſignes. But in the ſecond Example, they would all be found Retrograde except* Jupiter: *which Planet alſo will be found to be very neer to his former place, yet a little more forward, and conſequently neer to his firſt ſtation, then going to enter into it.*

*For it muſt alwayes be noted, that, if a Planet paſſe from direct motion to ſtation, then that ſtanding is the firſt ſtation. But if it paſſe from retrograde motion, then is the ſtation following to be taken for the ſecond ſtation.*

11 *De Latitudine aſcendente & deſcendente.*

INventis ſic prius latitudinibus ad rectum tempus examinentur de novo ad 2, 3, 5, vel 10 diem ſequentem, & utrum ſint aſcendentes, vel deſcendentes dignoſces. Hoc modo.

Si poſt ſecundam inquiſitionem inventi fuerint in eâdem plagâ (*viz.* vel Septentrionali vel Meridionali) quâ antea, tum ſi ſit cujuſque latitudo ad utrumque tempus, vel Meridionalis decreſcens, vel à Meridie ad Boream mutata, & creſcens, dicuntur aſcendentes.

Sin verò ad utrunque tempus latitudo fuerit Septentrionalis decreſcens, vel mutata à Boreâ ad Meridiem, & tum creſcens, vocantur deſcendentes.

Denique ſi ad utrumque tempus conſiſtant: ſunt in puncto variationis. *viz.* ſi in Boreâ latitudine conſtiterint ab aſcendente vergunt ad deſcendentem; ſi in Meridionali à deſcendente ad aſcendentem.

12 *De*

11 Of latitudes aſcendent or deſcendent

*AFter the latitudes of the Planets are found for any aſſigned time, if they be again examined for* 2, 3, 5, *or* 10 *dayes after, you may know whether they be aſcendent, or deſcendent, in this manner.*

*If in the ſecond enquiry they be found ſtill in the ſame coaſt or denomination (of North or South latitude) that they were before, then*

*If the latitude at both times be either South and decreaſing, or elſe changed from South to North, and then increaſing, they are then ſaid to be aſcendent. But*

*If their latitude at both times of enquiry be either North decreaſing, or elſe change from North to South and then increaſing afterwards, they are then ſaid to be deſcent.*

*If at theſe two times of enquiry they be found conſiſtent, then are they upon their change, namely, if conſiſtent and in North latitude, they are changing from aſcendent to deſcendent: but if conſiſtent and in South latitude, then are they changing from deſcendent to aſcendent.*

12 *Of*

12 *De Planetarum Aſpectibus.*

COmpara duorum quorumlibet loca ad datum tempus & deprehendes Aſpectus juxta regulas noni præcepti.

Exempli gratiâ in primo præcedentium Exemplorum *Sol* & *Jupiter* ſunt propemodum in conjunctione. *Sol* & *Saturnus* prope Trinum. *Saturnus* & *Jupiter* non procul à Trino. *Saturnus* & *Mercurius* prope Trinum. *Venus* & *Mercurius* non procul à Sextilo. Et pariter de reliquis.

Attamen illud obiter notandum, quod licet *Jupiter* & *Sol* tendant ad conjunctionem, & nobis terricolis revera appareant conjuncti, tamen per ſextam præcedens diſtant ab invicem 18700 ſemidiametris Terræ.

12 Of the Planets Aſpects.

*COmpare the places of any two of the Planets together, & you ſhall have their Aſpects for the time aſſigned, according to the former rules in the ninth precept.*

*Thus (rudely) in the firſt of the former Examples. The* Sun *and* Jupiter *are neer in Conjunction. The* Sun *and* Saturn *not farre from a Trine.* Saturn *&* Jupiter *not farre from a Trine.* Saturn *and* Mercury *neer to a Trine.* Venus *and* Mercury *not farre from a Sextile. In the ſame manner you may deale with the reſt.*

*But by the way note this, that though* Jupiter *and the* Sun *are neer to a conjunction, and to us that are upon the earth doe appear as if they were really together, yet by the precedent ſixth Propoſition, they are diſtant from each other* 18700 *ſemidiameters of the Earth.*

13 *Utrum Planetæ ſunt Combuſti, Acronychi, Orientales, vel Occidentales.*

PLanetæ dicuntur Orientales quorum loca diſtabunt à terra minus ſemicirculo juxta ſeriem ſignorum numerato. Occidentales è contra. Si ſint in

13 Whether the Planets be combuſt Acronychal, Oriental, or Occidental.

*THoſe Planets are Orientall whoſe places being reckoned from the place of the* Earth, *according to the ſucceſſion of the* 12 *ſignes, are diſtant from it leſſe*

in loco Terræ ſunt Acronychi, ſin loco Terræ oppoſiti vocantur combuſti.

Sic in præcedentium exemplorum primo *Saturnus* erit Orientalis quia à 21 *Arietis* ad primum *Cancri* juxta ſ.ſ. non completur ſemicirculus *Jupiter* combuſtus, *Mars* Occidentalis, quia à 21 *Arietis* loco(ſc.) Terræ ad quartum *Sagittarii* locum *Martis* intercipiuntur plus 180 gradibus. *Venus* Orientalis, *Mercurius* Occidentalis. Nullus hic Acronychus quia eorum loca multum diſtant à terra.

*leſſe then a ſemicircle, or 6 ſignes. And they again are Occidental whoſe places ſo counted, are diſtant from the Earths place more then a ſemicircle. If their places be the ſame with the Earths place, they are Acronychal, if oppoſite, they are Combuſt.*

*Thus in the firſt of the two former Examples*; Saturn *is Oriental, becauſe from the* 21 *deg. of* Aries *to the* 1 *deg. of* Cancer *(which is according to the order of the ſignes) is leſſe then a ſemicircle.* Jupiter *is combuſt.* Mars *is Occidental, becauſe from the Earths place which is* Aries 21 *deg. to the place of* Mars *which is* Sagittarius 4 *deg. is more then a ſemicircle or* 6 *ſignes.* Venus *is Oriental.* Mercury *is Occidental. None of them are Acronychal, becauſe their places are not neer to the place of the Earth, but much differing from it.*

## 14 *De Ortu & Occaſu Poëtico.*

APud Poëtas dicuntur Planetæ oriri, & occidere Coſmicè, Acronycè, & Heliacè; harum paſſionum detectio (utpote etiam occultationum, & emerſionum) in his Theoricis expectari non debet. Res eſt

## 14 Of the Poetical riſings and ſettings.

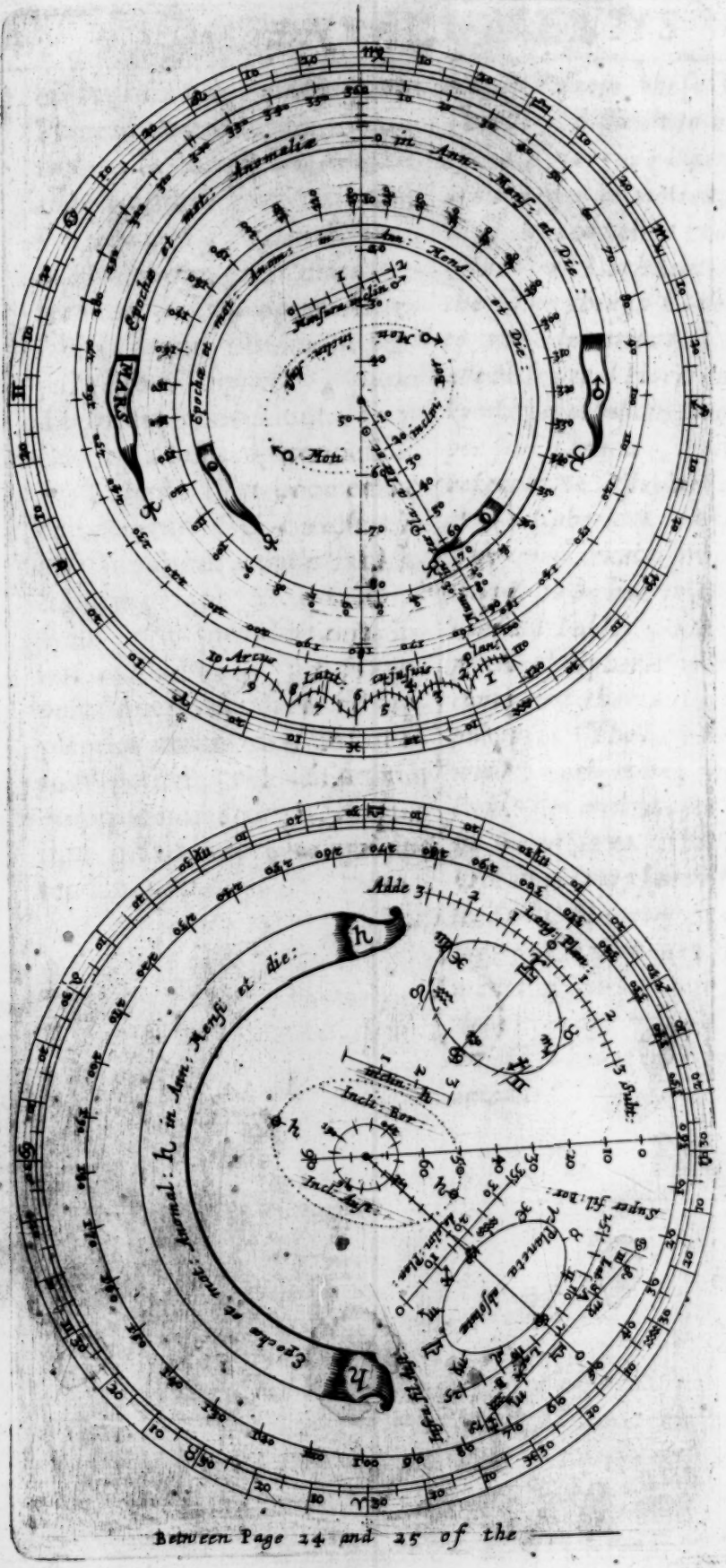
THe *Poëtical kindes of riſing and ſetting are called Coſmical, Acronychal, and Heliacal. Theſe and ſome other paſſions of the Planets (ſuch as are the Emerſions and Occultations) are not to be expected*

eſt per ſe ardua præſertim in Planetis ob eorum continuum motum & tum Longitudinis, tum Latitudinis variationem. Præterea ad elevationes Poli, & Horizontes particulares referuntur; quapropter Aſtrolabiis, atque iſtiuſmodi projectionibus Spheræ, non Theoricis conveniunt. Exactè ex Tabulis Aſtronomicis, & Calculo Trigonometrico deducuntur. Qui curioſiùs in hæc inquirunt exinde ſatisfactionem petant. Hæc quæ ſcripſimus pro introductione inſerviant ad magis præciſas operationes, vel ſaltem ad ſupplendos eorum defectus quorum peritiâ, vel deſiderium eouſque non attingit, & quorum gratia hæc præcipuè intendimus.

*expected from theſe Theorics. They are difficult to be found, eſpecially for the Planets, which are alwayes in motion, not reſiding any long time in one Longitude and Latitude. Beſides, the ſame things have relation to the clevations of the Pole above ſeveral Horizons, which kind of concluſions are not proper for Theorics, but muſt be referred to Aſtrolabes and other Spherical Inſtruments. The moſt exact practice this way is to be had in the Aſtronomical Tables, and Trigonometrical Spheric works to be conjoyned therewith for ſuch purpoſes. They therefore that would have more, muſt there ſeek help and wayes to ſatisfie themſelves. This that is here done, may ſerve for an introduction to more exact workings: at leaſt it may ſupply the wants of ſuch, whoſe skill and deſires reach not ſo farre; for whoſe ſakes it was principally intended.*

FINIS.

DE

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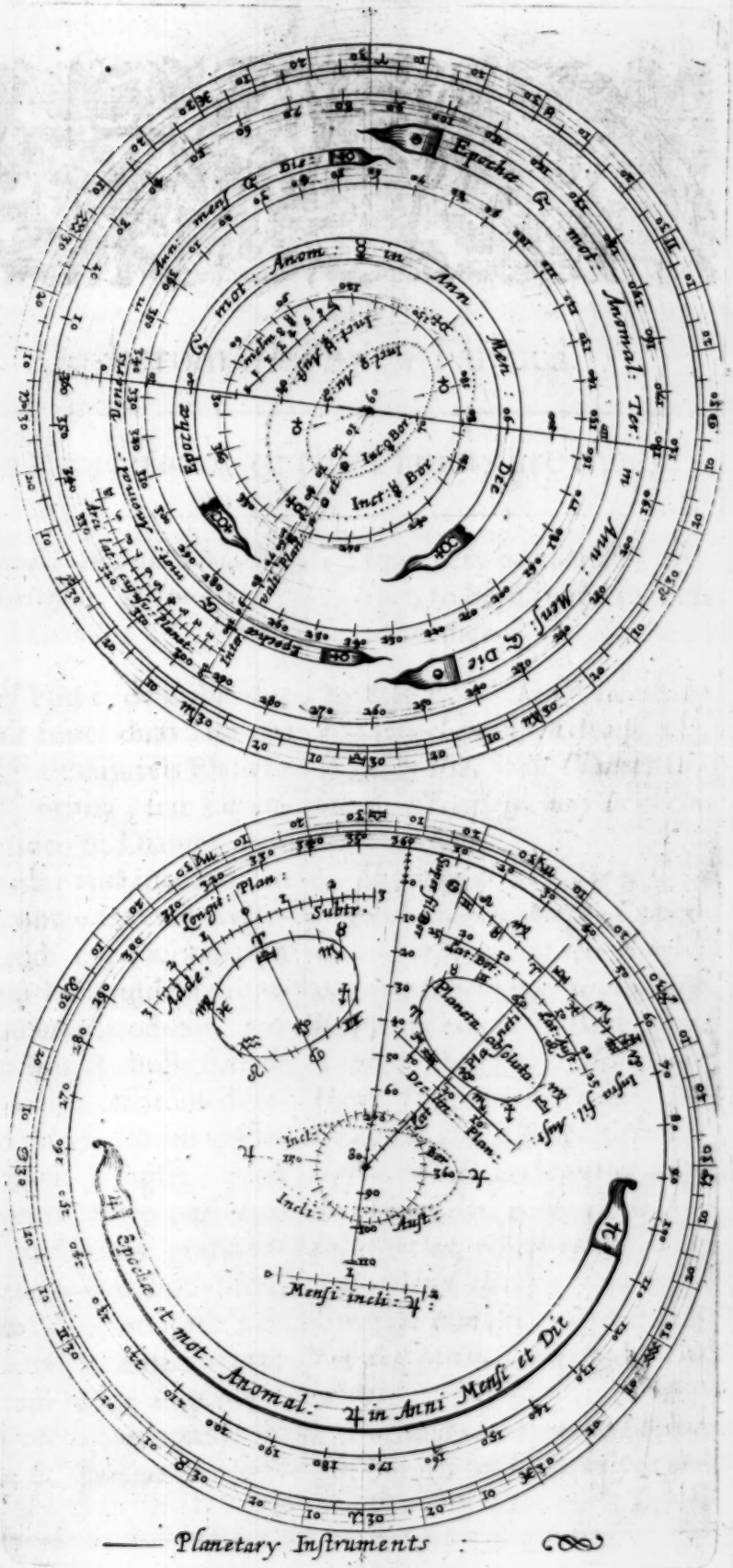
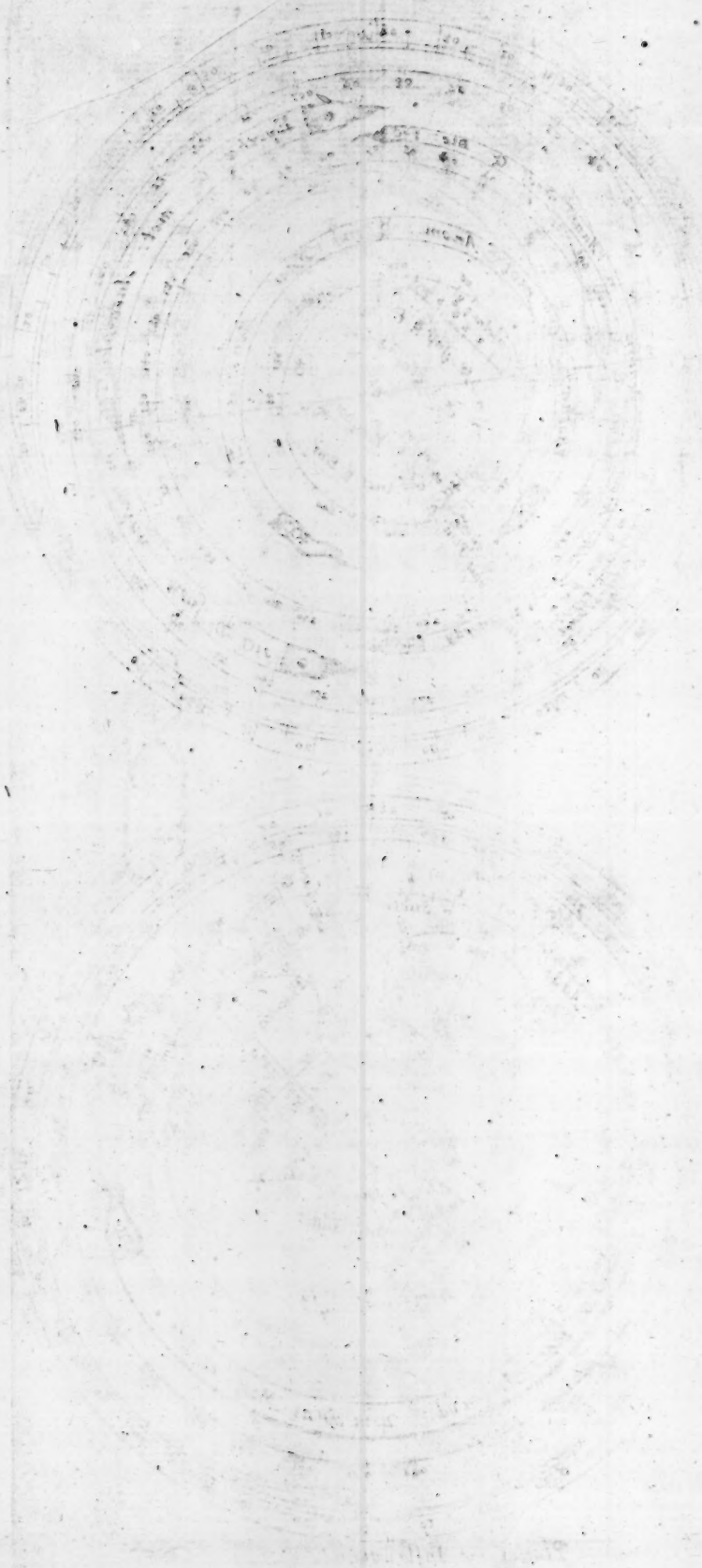



—— Planetary Instruments :



# De harum *Theoricarum* Fabricâ.

## How theſe *Theorics* of the Planets are made.

1 *Quomodo quævis Theorica commodiſſimè diſponatur.*

OPtimè deſcribuntur ſuper duas laminas ut cujuſvis Planetæ orbita, ſeu Eccentricus majoris ſit Diametri.

Methodus quâ incedo, in genere, concordat cum Syſtemate mundi *Copernicano*, in ſpecie cum iſtâ ejuſdem diſpoſitione quàm introduxit *Keplerus* in ſuis Tabulis *Rudolphinis* cùm hâc tantùm differentiâ. *Keplerus* orbitas Planetarum facit Ellipſes, quòd verò proprius, Ego perfectos Circulos facilitatis gratiâ facio. Defectus ex hoc diſcrimine procedens non erit magni momenti in Inſtrumentis non nimium magis amplis.

Ad majorem concinnitatem *Saturnum* & *Martem* in oppoſitis

1 How every particular Theoric is to be diſpoſed for beſt convenience.

IT *is beſt to make them upon two plates, that each Planets Orbit or Eccentric may be of the larger extent.*

*The way that I goe is (in general) agreeable to* Copernicus *his frame of the World; and in particular, to that which* Kepler *uſeth in his* Rudolphin *Tables. Onely this difference there is:* Kepler *makes the Orbits of the Planets to be Elipſes, which is the better way; and I here doe make them perfect Circles, which is the eaſier way. And though it be defective yet it makes no great difference in theſe ſmall Inſtruments.*

*For moſt convenience I have put* Saturn *and* Mars *upon one*

sitis faciebus ejusdem laminæ dispositi. In alterius laminæ facie è quidem altera *Jovem* alterâ terram cum *Venere* & *Mercurio*: interim̃s comprehensis, locavi. Scalas etiam aliàs vacuis locis ad alios usus addidi. Insuper, necessitate id requirente, orbita terræ quater repetitur, *viz.* in utrâque laminâ utrinque cum proportione ad exigentiam cujusque Planetæ requisitâ.

*Table, each of them taking up one side. Upon the other Table, on one side is set* Jupiter, *and upon the other side is the earth at large, with* Venus *and* Mercury *comprehended within it. Other Scales there are added (in spare places) for other uses. Likewise the orbit of the earth is placed upon each side of the two plates, that is, it is four times repeated, need requiring it should be so often iterated. It is also proportioned for the quantity of it, according to the exigence of each several Planet.*

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2 *De Planetarum & Terræ eccentricis.*

PRimò in singulis laminarum faciebus describatur Circulus qui priùs in 360 gr. divisus, ulterius in duodecem partes cum 12 Zodiaci signis notatas distinguatur. Numeretur quodlibet signum 10, 20, 30. Itaque hi Circuli Zodiacum ad colligendas Planetarum Longitudines necessarium designabunt. In Centro pingatur Solaris effigies monstrans Solem in Centro Mundi locum habere.

2 Hoc

2 Concerning the Eccentrics of the Planets and the Earth.

FIrst *you are to make* 4 *limbes upon the* 4 *sides of your two plates, dividing each of them into* 360 *deg. and distinguishing the whole Circle into* 12 *signes, unto which their* 12 *names, or* 12 *characters, or both, must be annexed. Each signe is to be numbred by* 10, 20, 30 *deg. and so these Circles will (each of them) represent the Zodiac, in which the Long. & of the Planets must be found. In the Center you may draw the effigies of the Sun, signifying thereby, that the middle or Center of the World is his proper place.*

2 Then

2 Hoc facto, ſic perge (ſit pro exemplo *Saturnus*.) Ex Tabula C, excerpe Aphelium in columna directè ſub *Saturni* charactere (nempe, *Sagittarius* 27 gr. 30 m.) A Centro ad 27 gr. 30 min. *Sagittarii* in Zodiaco, duc Semidiametrum, in quâ paululum diſtans à limbo verſus Centrum aſſume punctum, quòd pro *Saturni* Aphelio habeatur. Diſtantia verò abindè ad Centrum, dividi concipiatur in 100000 partes æquales quæ inſtar Scalæ decimalis ad reliquum opus peragendum inſerviat.

In hâc Scalâ 100000 ſumatur *Saturni* eccentricitas, ex Tabulâ A, nempe 05387 & ſuper eadem lineâ à Centro Solis verſus punctum Aphelium transferatur. Iſtud intervallum vocetur *Saturni* eccentriticas, vel ſi malueris cape numerum 94631 ex eadem Tabula A, qui ſuper Scalâ eadem, â puncto Aphelio verſus Solem tranſlatus, dabit ideme centricitatis punctum, quod ita inventum erit Centrum orbitæ *Saturni*.

Si

2 *Then for the other work (for inſtance ſuppoſe the Planet* Saturn) *you are firſt out of the Table* C, *to look where the place of his Aphelium is (which is ſhewed by the firſt number in the Table under the character of* Saturn) *namely* Sagittarius 27 *gr.* 30 *m. Wherefore from the center of the* Sun, *to the* 27½ *g. of* Sagittarius *in the Zodiac, draw a Semidiameter: in which, a little within the Zodiac towards the Center, aſſume any point, which you muſt ſuppoſe to be the Aphelial point of* Saturn: *and the diſtance from that Aphelial point to the Center, muſt be ſuppoſed to be divided into* 100000 *equal parts, which muſt ſerve as a decimal Scale for the reſt of the work.*

*Out of that Scale of* 100000, *take* Saturns *eccentricity, according to the quantity of it ſet down in the Table* A, *namely,* 05387, *and ſet it off upon the ſame line, from the Center of the Sun towards the Aphelial point. This diſtance is called* Saturns *eccentricity. Or you may take the number* 94613 (*which is alſo in the ſame Table* A) *out of the equal Scale, and ſet that diſtance from the Aphelial point towards the Center of the Sun, and it will give the ſame point of eccentricity. This point thus found, is the Center of* Saturns *orbit.*

Si igitur, ab hoc Centro ad punctum Aphelii, ut Semidiametro describatur circulus orbitum *Saturni* descripseris.

3 Denuo regulâ ad Centrum Solis applicatâ juxta signa & numeros in Tabula C sub charactre *Saturni* notatos, decimum quemque Anomaliæ sive divisionis orbitæ *Saturni* gradum transferas; & tandem sub divisis his partibus majoribus in decem minores æquales (nam æquales sufficient licet rigidè sumptæ inæquales esse debent) habebis 360 gradus Anomalos pro *Saturni* orbitâ. Hi â puncto Aphelio per 10,20,30, ad 360 & secundum seriem singulorum numerentur.

4 Orbita terræ circa Solem ad orbitam *Saturni* justè proportionata nunc venit inserenda. Ad quod faciendum inspiciatur secundo Tabula C cujus numerus primus sub signo terræ. Ostendit Aphelium terræ in *Capricorni* 7 gr. 00 m. applicatâ igitur regulâ à centro ad septimum *Capricorni* gr. ducatur linea delebilis quæ lineam terræ Apheliam representabit.

Deinde

*And therefore, if you set one foot of your compasses upon that Center, opening the other to the Aphelial point, & describe a Circle to that extent, and upon that Center, you shall then describe the orbit of* Saturn.

3 *After this, By laying a ruler to the Center of the Sun, and by the numbers & signes in the Table* C *under the character of* Saturn, *you may inscribe each* 10$^{th}$ *deg. of the Anomaly or division of* Saturns *Orb. And again, dividing each of those large parts into ten lesser equal parts (for, equal will well serve though in rigour they ought to be otherwise) you shall have the* 360 *Anomalar deg. of* Saturns *Orbit. These are to be numbred from the Aphelial point, by* 10, 20, 30, *to* 360, *ending in the same point: and the order of numeration must be according to the series of the* 12 *signes in the Zodiac.*

4 *The next thing to be done, is the setting in of the earth course about the Sun, proportioned justly to this orbit of* Saturn. *And for this, look again in the Table* C, *the first number whereof under* Earth *shewes where the Aphelium of the Earth lyes, viz. in* Capricorn 7. *d.* 00 *m. Therefore laying a ruler from the center of the Sun to the* 7$^{th}$ *deg. of* Capricorn, *draw an obscure line, which will be the Earths Aphelial line.*

Then

Deinde conſule Tabulam A, ubi deprehendes punctum Aphelium Terræ à centro Solis diſtare 10128 partibus prioris Scalæ lineæ ſc. *Saturni* in 100000 partes diviſæ. Per has partes ex ſcalâ deſumptas punctum terræ Aphelium in debitâ diſtantia transferas. Conſulo rurſus prædictam tabula A. Et videbis terræ eccentricitatem eſſe 00179 partium prioris ſcalæ decimalis quæ ex ſcalâ prædictâ deſumptæ in lineam terræ Apheliam à centro Solis tranſferendæ ſunt. Punctum tranſlatum erit Eccentrici terræ centrum. Vel ſi diſtantia iſta ſit nimis brevis in eâdem tabulâ invenias diſtantiam Aphelii terræ à centro Eccentrici ejuſdem eſſe 09949 partium quæ ex priori ſcalâ decerptæ & à puncto Aphelii terræ ſuper lineâ terræ Apheliâ verſus Solis centrum tranſmiſſæ centrum eccentrici terræ monſtrabunt. Super hoc centro ad intervallum puncti terræ Aphelii ſcribe circulum qui orbitam terræ repræſentabit ad magnum *Saturni* orbem juſtè proportionatam.

5 Minor hic circulus ſeu terræ

*Then look into the Table* A, *where you ſhall find the Earths Aphelial point to be diſtant from the center of the Sun* 10128 *parts of the former decimal ſcale or* 100000 *equal parts of* Saturns *line. By which parts taken from that ſcale, you may ſet off the Earths Aphelial point in a true diſtance. Again, look into the Table* A, *and you ſhall there ſee the Earths eccentricity to be* 00179, *of the ſame parts of the former decimal ſcale, which you are to take and ſet from the center of the* Sun, *upon the earths Aphelial line, and that point ſhall be the Center of the earths eccentric. Or if that be too ſhort a diſtance, you may in the ſame Table find the diſtance of the Aphelium (or Aphelial point) of the earth from the center of the Earths orbit or eccentric to be* 09949: *& this number taken out of the former decimal ſcale, & one foot of it ſet in the Aphelial point of the earth, the other upon the Aphelial line of the Earth, towards the center of the* Sun, *will ſhew the ſame center of the earths eccentric. Upon this center therefore, and to the extent of the Aphelial point of the earth from it, deſcribe a little circle, which is to reſemble the earths orbit, being juſtly proportioned to the great orb of* Saturn.

5 *This little orbit or circle of the*

terræ orbita in debitas partes anomalias dividenda est, quarum decima quælibet numeris Tabularibus sub charactere Terræ in tabula A inscribi potest: regulâ (scilicet) ad centrum Solis fixâ, & ad gradus & signorum Zodiaci minuta in prædictâ Tabulâ datis applicatâ. Hæ partes denuo bisecentur ut quælibet pars quinque gradus significet, vel in Instrumentis majoribus in quinque partes æquales possint dividi quarum quælibet duos gradus Anomaliæ denotabit. Hæ partes à puncto terræ Aphelio per 10, 20, 30, &c. ad 360 numerandæ sunt. Atque hoc modo Eccentrici *Saturni* & *Terræ* debite proportionati disponuntur, & dividuntur.

Eodem pariter modo in Theoricis *Martis* & *Jovis* operandum est, usurpando columnas *Marti* & *Jovi* destinatas in Tab. A, unâ cum columnâ terræ & quales numeri pro *Saturno* ex Tabula A tales pro *Marte* & *Jove* ex Tabula E & D desumendi sunt.

Similiter per *Terrâ*, *Marte*, & *Mercurio*: qui tres ex una laminarum facie collocandi sunt. Linea terræ Aphelia à centro Solis

*the Earth, is to be divided into its just Anomalar parts. Each tenth of which may be inscribed by the numbers of the Table* C, *which are placed under the word of* Earth, *by a ruler laid to the Center of the Sun, and to such degrees and minutes of the signes in the Zodiac, as shall be given out of the forementioned Table. And these* 10^ths *may be bisected, & so each division may signifie* 5 *deg. Or else each of them may be divided into* 5 *equal parts, every one of them signifying* 2 *deg. of Anomaly: this is to be done in larger Theorics. These Anomalor parts of the Earth are to be numbred from their Aphelial point, by* 10, 20, 30, *and to* 360. *Thus are the Eccentrics of* Saturn *and the* Earth *to be proportioned, placed, and divided.*

*In the same manner you are to work for the Theorics of* Mars *and* Jupiter, *if you use the columnes of* Mars *and* Jupiter *in the Table* C, *together with the columne of the* Earth: *and what numbers were taken for* Saturn *out of the Table* A, *the like numbers must be taken out if the Tables* E *and* D *for* Mars *aud* Jupiter.

*So also for the* Earth, Venus, *and* Mercury. *These three are to beplaced together upon one side of one of the plates.*

The

Solis ad punctum *Terræ* aphelium extenſa & in 100000 diviſa inſervit pro decimali ſcalâ ad inferendos omnes numeros eccentricos horum trium Planetarum. Ex hâc ſcalâ numeri proportionandis eccentricis *Terræ*, *Veneris* & *Mercurii* in tabulis B, F & G, deſumantur. Quorum lineæ Apheliæ & diviſiones graduum Anomalorum diſponuntur, & determinantur per columnas tabulæ C, iſtis Planetis reſpondentibus: regulâ ut antea ad centrum fixâ, & ad ſigna, & gradus Zodiaci ſuper has Theoricas ducendos applicata.

Minores iſtæ Tabulæ numerales pro colligendis Anomaliis Terræ reliquorumque Planetarum eodem modo cuique orbitæ inſcribantur, prout in ſcematibus appareat. Et iidem ſunt numeri poſteà in Anomaliarum Tabulis tranſcripti.

Tabulæ numerales pro Terra bis repetuntur in utrâque laminâ ſemel. *viz.* in Theorica *Martis*, & in illis *Veneris* & *Mercurii* eo fine ut utraque lamina curſum terræ teneret abſque alterius ope. Et iſtic loci diſponuntur quia non datur alius magis conveniens.

Circuli

*The decimal ſcale for all the nũbers of eccentricity for theſe 3 Planets, is the Aphelial line of the* Earth, *reaching from the Center of the Sun to the Aphelial point of the* Earth, *divided into* 100000 *equal parts. And out of that ſcale the numbers of the* Earth, Venus *and* Mercury *in the Tables* B, F *and* G, *muſt be taken for the proportioning of their eccentrics. And the right placing of their Aphelial lines, with the diviſions of their Anomalar degrees, muſt be limited by the columns of the Table* C, *which anſwer to thoſe Planets: a ruler being laid from the Center of the Sun to the ſignes and degrees of the Zodiacal limbes drawn upon the Theorical plates.*

*The little numeral Tables, for gathering the Anomalyes of the Earth and any Planet, may be written to each orbit, in ſuch faſhion as my draughts of theſe Theorics doe ſhew: & are the ſame numbers that are ſet down in the Tables of Anomalyes hereafter ſpecifyed.*

*The numeral Tables for the earth are twice written, upon each plate once; namely, in the Theoric of* Mars, *and in that of* Venus *and* Mercurie; *to the end that each table might have the earths motions upon it, without being beholden to the other. And they are there ſet,*

*becauſe*

Circuli enim terræ in Theoricis *Saturni* & *Jovis* nimis sunt parvi ad eas commodè tenendas.

*becauſe in thoſe two places onely is convenient roome for them. For, the Circles of the earth upon the Theorics of* Saturn *and* Jupiter, *are two little to hold them.*

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## 3 *De ſcalis Diſtantiarum.*

IN ſingulis Inſtrumenti faciebus ſcalæ partium æqualium deſcribuntur ad metiendas diſtantias Planetæ tam à Sole quàm à Terrâ inſcribuntur in lineis Apheliis exterioris Planetæ, *viz.* in Apheliis *Saturni*, *Jovis*, *Martis* & *Terræ* Determinantur ex tabulâ H, & ratio hujus limitationis eſt ut ejuſdem proximè eſſent ad invicem magnitudinis, & interim numeros admitterent ad ſemidiametros ſine magno labore reducibiles.

Modus conficiendi videatur in exemplo *Saturni*. Numerus *Saturni* in tabulâ H eſt $85\frac{63}{100}$ ſi igitur (ope Sectoris aut aliter) hujus Planetæ lineam Apheliam (ex Theoricâ) à Solis centro ad *Saturni* Apholium ſumpſeris, & Sectoris crura ad hanc longitudinem in terminis $85\frac{63}{100}$ in lineâ partium æqua-

## 3 Concerning the ſcales of diſtance.

*UPon every ſide of the two Plates, there are ſcales of equal parts to meaſure the diſtances of the Planet from the Sun and from the Earth. They are inſcribed upon the Aphelial lines of the exteriour Planet: namely, upon the Aphelial lines* Saturn, Mars, Jupiter, *and* Earth. *The limiting of them is taken from the table* H: *and the reaſon of this limitation is, becauſe they ſhould be of ſomewhat neer an equal bigneſs one to another, and yet alſo that they might be of ſome ſuch numbers that may be reduced to ſemidiameters without any great trouble.*

*The manner of making them, may be ſeen in the example of* Saturn. *The number for* Saturn (*in the table* H) *is,* $85\frac{63}{100}$ *If therefore (by help of the Sector, or otherwiſe) you take the Aphelial line of this Planet (out of the Theoric) from the center of the Sun to the Aphelial point of* Saturn, *and open the*

æqualium aperueris habebis numeros quos volueris rotundos utpote 80, 70, &c. pro hujus ſcalæ diviſionibus. Qui à ſectore ad lineam Apheliam à puncto *Saturni* Aphelio tranſlati dabunt longitudinem 80, 70, &c. partium in ſcalâ æqualium quas denuo dividas &prout in ſchemate continues in *Saturno*, & *Marte*, ad 100 in *Jove* et *Terra* ad 120. Integra ſcala non neceſſario dividitur in plures 10 partibus largioribus quarum ſupremæ in 10 minores ſubdiviſæ (prout moris eſt) numeri apponantur ut in ſchematibus videre eſt.

Sic in *Jove* dividendum eſt ſpatium ab Aphelio ad Solis centrum in $92\frac{87}{100}$ & ita de reliquis juxta numeros Tabulæ H.

*the Sector to that extent, in the number* $85\frac{63}{100}$ *in the line of equal parts, you ſhall then have any even number or diviſió from the ſame ſcale of equal parts, as of* 80, *or* 70, *&c. which being taken from the ſector, and transferred to the Aphelial line, and being ſet thereon, from the Aphelial point of* Saturn, *you ſhall have the length of* 80 *or* 70 *of thoſe equal parts. Theſe you may divide and continue as farre as they are in my Theorics: namely, in* Saturn, *and* Mars, *to* 100, *in* Jupiter *and the* Earth *to* 120. *You need not divide the whole ſcale any more then into* 10 *large parts, and the uppermoſt of them alone may be ſub-divided into* 10 *leſſer equal parts. After which they are to be numbred in ſuch manner as is uſual in ſuch decimal ſcales, and as in thoſe Theorics is to be ſeen.*

*So for* Jupiter, *you are to divide the ſpace from his Aphelial to the center of the* Sun, *into* $92\frac{87}{100}$, *and ſo all the reſt accordingly as their numbers, in the Table* H, *do require.*

## 4 *De Nodis & ſcalis inclinationum.*

USus Tabulæ M eſt ad inſerviendos nodos quinque Planetarum nam Terra nullum habet

## 4 Of the Nodes and ſcales of inclination.

THe *Table* M *ſerves to put in the Aſcendent Nodes of the* 5 *Planets; for the Earth*

habet. Methodus videatur in exemplo *Saturni*. Nodus *Saturni* aſcendens eſt 22 grad. 27 min. *Cancri*. Poſitâ igitur regulâ à centro Solis ad 22 gr. 27 min. *Cancri*: in limbo delebilem ducas lineam quæ erit communis ſectio plani eccentrici Planetæ, & Eclipticæ. In hâc lineâ duo quælibet puncta oppoſita æqualis utrinque à centro diſtantiæ aſſumas ut in ſchemate ad characteres ♄ ♄, ob planum in quo curſus *Saturni* deſcribitur. Per hæc duo puncta ducitur ellipſis punctis diſterminata (vel aliâ circularis quælibet ad libitum figura) in cujus altera medietate (iſta ſcilicet) quæ à 22 grad. ½ *Cancri*, juxta ſeriem ſignorum procedit) ſcribatur *SATURNI Inclinatio Borea*. In reliquâ *SATURNI Inclinatio Auſtrina*.

Minor ſcala ad metiendas *Saturni* inclinationes terminos habet et ſuos limites in hunc modum. Inſpicè Tabulam N, ubi invenies maximam *Saturni* inclinationem 2 gr. 32. m. Cape igitur diſtantiam alterutrius

*hath none. The manner of it may be ſeen in the example of* Saturn. Saturns *Aſcendent Node is in the* 22 *deg.* 27 *min. of* Cancer. *Therefore laying a ruler from the Center of the Sun to the* 22 *deg.* 27 *min. of* Cancer *in the limbe, you may draw an obſcure line at length: this line is the common ſection of the plain Planets eccentric with the plain of the Ecliptic. In this obſcure line you may aſſume any* 2 *points, oppoſite one to the other, and of equal diſtance from the Suns Center on both ſides, as is done in my Theorics at the characters of* ♄ ♄, *for the plain on which the courſe of* Saturn *is drawn. Through which two points is drawn a prickt ovall (which might have been of any other compaſſing form, as a Circle, or the like) in the one half of which (namely, that which goes from the* 22½ *deg. of* Cancer, *according to the ſeries of the* 12 *ſignes) is written* SATURNI Inclinatio Borea; *and on the other half is written* SATURNI Inclinatio Auſtrina. *So this particular is done.*

*Then for the little ſcale, which is to be the meaſure of* Saturns *inclinations, that is thus to be limited. Look in the Table* N, *where you ſhall ſee the greateſt inclination of* Saturn *to be* 2 *deg.* 32. *min. Take then*

utrius puncti (notati ♄, ♄) à centro Solis, & ad hanc distantiam aperiantur crura sectoris in lineâ partium æqualium à terminis 2 $\frac{33}{65}$.

Ex sectore sic aperto capias distantiam in terminis 3, 3, in lineâ partium sectoris æqualium tres partes ex quæ longitudinem dabit scalæ notatæ 1, 2, 3, ad mensurandas *Saturni* inclinationes. Quæ in tres partes, significantes tres gradus, quarum singula in quatuor aliàs æquales dividatur. Hoc modo opus harum linearum in Theoricis *Saturni* peragitur.

Similiter faciendum est pro reliquis Planetis usurpando numeros illis pertinentes & in Tabulis M & N expressos. Ampliore igitur non opus erit directione.

*then the length or distance of either of the fore-named two points (noted with ♄♄) from the Center of the Sun, and with that distance, open the sector in the line of equal parts from 2 $\frac{33}{65}$.*

*When the sector is so opened, you may take off 3 in the line of equal parts, and that shall give the length of that Scale which is to measure the inclinations of* Saturn, *noted with* 1, 2, 3. *This scale may be divided into 3 equal parts: first, which are to signifie 3 degrees: and these again may be quartered. This is the work to be done for these lines upon the Theoric of* Saturn.

*The like must be done for every other Planet, by making use of the numbers belonging to each of them, expressed in the Tables* M *and* N. *There will therefore here need no more direction.*

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## 5 *De Scalis Latitudinum.*

IN utrâque laminâ, & super istam faciem ubi Theoricæ *Martis* & *Veneris* ducuntur una istiusmodi scala describitur, ut neutra alterius indigeat. Linea à Solis Centro ducta est partium 120 æqualium. Arcus seu scala curvilinea super

## 5 Concerning those Scales that are to find the Latitudes.

THere *is upon each of the two plates one of this sort of scales, that so one plate may have no need to seek help from the other. They are drawn upon those sides on which* Mars *and* Venus *are placed. The line drawn from the Center of the*

ſuper priorem pendens in 10 grad. diſpeſcitur *Martis* Tabula Q, *Veneris* Tabulâ notatâ R, quod varietatis tantùm cauſâ fit nam aliter Tabula Q ſola utrique ſatisfeciſſet. Sed hæc cautio obſervata digna eſt, quod ſcilicet recta à Centro Solis ad peripheriam tendens, juſtum aliquem Zodiaci gradum ſecet. Quia gradus iſti Tabulares (per quos inæquales ſcalarum partes expenduntur) ex limbi gradibus ſumi debent, & propterea commodiùs, & ad faciliorem numerationem lineâ prædictâ in æqualem gradum cadat.

*Sun is an equal ſcale divided into 120 parts. The arke or curved ſcale which hangeth upon the former, is divided into 10 degrees; that upon* Mars, *by the Table noted with* Q: *that upon* Venus, *by the Table* R. *They might have been done both by one Table (as by that with* Q) *but onely for variety. This caution alone is here to be obſerved, namely, that the ſtreight line comming from the Center be made to but upon ſome juſt degree of the Zodiac or limbe: becauſe thoſe degrees in the forementioned Tables (by which the un-equal parts of the annexed ſcales are limited out) are to be taken in the limbe. And therefore it will be moſt expedient for eaſe in account to let the line point upon ſome even degree.*

Atque hoc modo Theoricæ ſcalis ſatis commodis ad inveniendas tam Longitudines quàm Latitudines quinque Planetarum inſtruuntur. Reliquæ de quibus dicendum reſtat accomodantur ad convertendas Longitudines, & Latitudines in Declinationes, & Aſcenſiones Rectas.

*Thus theſe Theorics are fitted with ſcales ſufficient for the finding out of the Longitudes and Latitudes of the 5 Planets. The other ſcales that yet remain to be ſpoken of, are fitted to turn the Longitudes and Latitudes into Right Aſcenſions and Declinations.*

## 6 *De Scalis Aſcenſionum Rectarum.*

SCalæ Aſcenſionum Rectarum, & Declinationum in Planis *Saturni* & *Jovis* deſcribantur, quia magis amplum eſt

## 6 Concerning the Scales for Right Aſcenſion.

THeſe *ſcales for Right Aſcenſions with thoſe of Declinations, are ſet upon the planes of* Saturn *and* Jupiter, *becauſe*

eſt in illis ſpatium ad eas commodè tenendas.

1 (In loco convenienti) ducenda eſt lineâ rectâ, & à Centro Solis arcus deſcribendus commodæ attamen arbitrariæ diſtantiæ cum numeris 1, 2, 3, ex utrâque parte lineæ rectæ adfixis. Gradus iſti 1, 2, 3, ſunt etiam arbitrarii, interim quantitatis aptæ recipiendis Ellipticæ figuræ diviſionibus adeò amplis ut diſtinctè in quatuor equales partes poſſint dividi.

2 Ex utrâque parte lineæ rectæ mediæ in ſcalâ Circulari ſic diviſâ numera 2 gr. 29 min. per quorum terminos à Centro Solis duc duas lineas delebiles.

3 Intra lineas obſcuras duc cujuſvis formæ Ellipſim ita tamen ut ejus extremitates juſtè tangant prædictas lineas delebiles per grad. 2. 29 min. ductas.

4 Huic figuræ ovali inſcribantur graduationes ope Tabellæ W, quintus aut decimus quilibet gradus inſeri poteſt reliquis tantum æqualiter diviſis. Ordo characterum, numerationis, & diviſionis modus videatur in ſchematibus. Atque hæc pro ratione conficiendi has ſcalas.

*becauſe their is moſt roome to hold them.*

1 *There is firſt a right line drawn (in ſome convenient place) without any diviſions upon it, and upon the Center of the Sun and ark deſcribed at any fit diſtance, unmbred with* 1, 2, 3, *on both ſides the right line. The degrees* 1, 2, 3, *are of any arbitrary length, ſo large that the oval figure may be of ſome quantity to receive a fit number of diviſions, and that the ſame diviſions may receive ſub-diviſions into large quarters. This is the firſt work.*

2 *Upon the Circular ſcale ſo divided, count* 2 *deg.* 29 *m. on both ſides the middle right line, and through theſe limits draw two obſcure right lines from the Center of the Sun.*

3 *Within theſe two obſcure lines, draw an oval figure of any forme, but ſo, as that the two extreme parts of it may juſtly touch the two former obſcure lines drawn through* 2 *d.* 29 *minutes.*

4 *After this oval figure is drawn, it is alſo to be graduated by help of the Table* W; *you may put in onely every* 5th *&* 10th *d. & whē they are put in, the reſt of the leſſer parts may be inſerted by equal ſubdiviſions. The order of their characte zing & numeration, and the manner of their diviſion, may beſt be ſeen in my*

7 De *Theories.*

### 7 *De ſcalis Declinationum.*

HÆ ſuper iiſdem Theoricarum planis quibus ſcalæ Arectarum inſiſtunt.

1 A Centro Solis ducatur rectâ lineâ. Cujus extremitas Soli proximâ dividatur in 10 partes æquales, quarum quælibet quadri ſecetur [ ſin ulterius procedere in animo ſit inæqualiter inſtar tangentium dividenda eſt ] hæc ſcalâ etiam eſt arbitrariæ modo, recipiendis minoribus diviſionibus, commodæ ſit longitudinis.

2 A Centro Solis & ſuper iſtâ lineâ deſcribitur arcus Circuli continentis ex utrâque parte lineæ rectæ 25 gr. iſtiuſmodi quales integer Circulus contineret 360 numeris utrinque ad fixis 00, 5, 10, 15, 20, 25, &c.

3 Ultra hunc arcum Circuli, ducitur lineâ rectâ infinite protenſa quæ priori ductæ inſiſtit ad rectos, & poſteà terminatur regulâ à Centro Solis utrinque per gradus Circuli

*Theorics. This will ſerve for direction to make theſe ſcales.*

### 7 Concerning the ſcales for Declinations.

*THeſe ſtand upon the ſame plaines of the Theorics, with the other ſcales of right aſcenſion.*

1 *Here is firſt drawn a ſtreight line from the Center of the Sun. That part which is neereſt to the Center is divided into* 10 *equal parts [but if they ſhould goe further then* 10, *they muſt then be unequal as Tangents are ] ſtanding for degrees: and each of them is cut into quarters. This ſcale of* 10 *degr. is not limited, but may be of any fit length for the ſubdiviſions.*

2 *From the Center of the Sun and upon this line, is deſcribed an ark of a Circle, which contains upon it (on each ſide of the ſtreight line formerly protracted )* 25 *true degrees (ſuch as the whole circle ſhould contain* 360*) which are accordingly numbred on both ſides, from* 00, *to* 5, 10, 15, 20, 25.

3 *Without this Circular ark is ſet a line perpendicular to that firſt drawn, and extended at length on both ſides, but afterwards it is to be limited, by laying a ruler from the*

Circuli 23 grad. ½ dimiſsâ: Atque ita lineæ ductæ per 23 grad. ½ ad *Cancrem* & *Capricornum* juſtos hujus perpendiculi limites diſtinguent. Dividitur verò hæc linea utrinque per Canonem ſinuum: quilibet quintus decimuſque gradus à cæteris diſtinguitur, & trigeſimus quiſque duplici charactere ſigni alicujus inſignitur, prout in ſchemate videre licet.

4 Quartò, In loco commodo deſcribenda eſt altera figura ad libitum Elliptica. At eâ conditione, ut ejus extremitates directè tangant delebiles iſtas lineas prius per gradus arcus circularis 23 ½ ductas.

Diviſiones imponuntur ope Zodiaci recti linei prius deſcripti applicando regulam ad initium cujuſque ſigni, & in hanc ovalem transferendo. Inſcriptio initiorum ſufficiet, nam gradus ex Zodiaco rectilineo deſumendi ſunt. Et iſta ovalis diviſio non fit alio fine niſi ad commodius transferendos gradus Zodiaci prioris, nam in hoc novo ſigna contrario ſtant ordine quam in priori *Cancro* cum *Capricorn* in medio *Aries* & *Libra* ad extremitates.

5 Re-

*the Center of the Sun to 23 ½ d. counted upon the Circular ark both wayes: ſo ſhall lines drawn through theſe 23 ½ deg. give juſt limits to this perpendicular line, at* Cancer *and* Capricorn. *The diviſions of this line are nothing but a double ſcale of ſines. Every 10th and 5th degree is to be diſtinguiſhed from the reſt, and every 30th degree is to be double charactered with ſome or other of the 12 ſignes, as is to be ſeen in my Theorics.*

4 *Again, there muſt an oval be here deſcribed, it may be of any faſhion, but muſt be ſet in place convenient, and in ſuch manner, that it may lye juſtly between the two former obſcure lines drawn through 23 ½ degrees touching them with its extremities.*

*The diviſions of it are to be taken from the former ſtreight charactered* Zodiac, *by laying a ruler from the Center, to the beginning of each of thoſe ſignes, and ſo transferring them into this oval. This inſcription of the onely beginnings of the 12 ſignes into the oval is ſufficient: for the degrees of theſe 12 ſignes muſt be taken out of the former ſtreight* Zodiac, *this new diviſion being onely added for conveniency of new charactering the degrees of the old* Zodiac. *For in this new one you*

*ſee*

5 Remanet adhuc Scala altera ſinuum rectorum ad gradus circiter 35, ubicunque volueris inſerenda quæ ſic determinabitur. Cape longitudinem Zodiaci rectilinei ab *Aricte* ad *Canceri* vel *Capricorni*, ad quam aperiatur Sector (commodiſſimè enim perficitur per illud inſtrumentum) in lineis ſinuum & in terminis $23\frac{1}{2}$. Deindè tranſferantur ſinus 35 grad. in hanc lineam rectam & ſic in partes debitas dividetur. Exemplar omnium videas in ſchematibus.

Hucuſque progreſſus ſum in declaratione Methodi quâ hæ Theoricæ cum omni earum apparatu, conſtruendæ ſunt ſequuntur Tabulæ anteà ſæpiùs nominatæ, ad plurima tam inſerenda quàm determinanda neceſſariæ.

Cancer *and* Capricorn *to ſtand in the middle*, *and* Aries *and* Libra *in the two extream places*, *contrary to what they did in the former Zodiac.*

5 *One Scale yet more remaines*, *containing the right ſines of* 35 *degrees. It may ſtand any where*, *and is thus to be limited. Take the length from* Aries *to* Cancer *or* Capricorn, *in the ſtreight Zodiac*, *and with that length open the Sector* (*for it is ſooneſt done by that inſtrument*) *in the line of ſines from* $23\frac{1}{2}$ *degrees thereon. Then from the Sector ſo opened, take the ſeveral ſines of* 35 *degrees*, *and inſert them into this line*, *ſo it ſhall be divided into its requiſite parts. The pattern of theſe things may be ſeen in my Theorics.*

*Thus farre I have gone in declaring the manner how theſe Theorics are made in all their particulars. There now follow the Tables that are mentioned before*, *by which many things are to be divided and limited.*

| | *Saturni* | *Jovis* | *Martis* |
|---|---|---|---|
| Sit diſtantia Aphelii à centro | 1000000 | 100000 | 100000 |
| Erit Eccentricitas. | 053870 | 04600 | 08479 |
| Ab Aphelio ad centrum Eccentrici | 946130 | 95400 | 91521 |
| Diſtantia Aphelii Terræ à centro | 101279 | 18676 | 61154 |
| Eccentricitas Terræ | 001791 | 00330 | 01081 |
| Ab Aphel. Terræ ad centr. Eccentr. Terræ | 099488 | 18346 | 60073 |
| | A | D | E |

| | *Terræ* | *Veneris* | *Mercurii* |
|---|---|---|---|
| Si diſtantia Aphelii Terræ à centro Solis ſit, 100000; | | | |
| Erit diſtantia Aphelii | 100000 | 71625 | 46126 |
| Eccentricitas | 01768 | 00491 | 08006 |
| Ab Aphelio, ad centr. Eccentrici | 98232 | 71134 | 38120 |
| | B | F | G |

C C C

| Anom. med. | Earth | ♄ | ♃ | ♂ | ♀ | ☿ |
|---|---|---|---|---|---|---|
| 360 | ♍ 7 00′ | ♐ 27 30′ | ♎ 7 49′ | ♏ 0 21′ | ♒ 2 49′ | ♐ 14 57′ |
| 10 | 16 39 | ♍ 6 26 | 16 55 | 8 42 | 12 41 | 21 38 |
| 20 | 26 19 | 15 24 | 26 02 | 17 05 | 22 33 | 28 22 |
| 30 | ♒ 5 59 | 24 26 | ♏ 5 12 | 25 32 | ♓ 2 25 | ♍ 5 12 |
| 40 | 15 42 | ♒ 3 31 | 14 25 | ♎ 4 06 | 12 19 | 12 11 |
| 50 | 25 27 | 12 43 | 23 45 | 12 48 | 22 13 | 19 23 |
| 60 | ♓ 5 14 | 22 03 | ♐ 3 11 | 21 41 | ♈ 2 08 | 26 50 |
| 70 | 15 05 | ♓ 1 31 | 12 44 | ♏ 0 48 | 12 04 | ♒ 4 38 |
| 80 | 24 59 | 11 10 | 22 26 | 10 09 | 22 02 | 12 51 |
| 90 | ♈ 4 56 | 20 59 | ♍ 2 18 | 19 48 | ♉ 2 01 | 21 33 |
| 100 | 14 58 | ♈ 1 00 | 12 20 | 29 45 | 12 02 | ♓ 0 51 |
| 110 | 25 03 | 11 13 | 22 31 | ♐ 10 01 | 22 04 | 10 51 |
| 120 | ♉ 5 12 | 21 39 | ♒ 2 53 | 20 38 | ♊ 2 08 | 21 39 |
| 130 | 15 24 | ♉ 2 16 | 13 25 | ♍ 1 36 | 12 12 | ♈ 3 21 |
| 140 | 25 39 | 13 04 | 24 06 | 12 53 | 22 18 | 16 00 |
| 150 | ♊ 5 57 | 24 01 | ♓ 4 54 | 24 28 | ♋ 2 25 | 29 37 |
| 160 | 16 17 | ♊ 5 07 | 15 49 | ♒ 6 17 | 12 33 | ♉ 14 08 |
| 170 | 26 38 | 16 17 | 26 48 | 18 16 | 22 41 | 29 21 |
| 180 | ♋ 7 00 | 27 30 | ♈ 7 49 | ♓ 0 21 | ♌ 2 49 | ♊ 14 57 |
| 190 | 17 22 | ♋ 8 43 | 18 50 | 12 26 | 12 57 | ♋ 0 33 |
| 200 | 27 43 | 19 53 | 29 49 | 24 25 | 23 05 | 15 46 |
| 210 | ♌ 8 03 | ♌ 0 59 | ♉ 10 44 | ♈ 6 14 | ♍ 3 13 | ♌ 0 17 |
| 220 | 18 21 | 11 56 | 21 32 | 17 49 | 13 20 | 13 54 |
| 230 | 28 36 | 22 44 | ♊ 2 13 | 29 06 | 23 26 | 26 33 |
| 240 | ♍ 8 48 | ♍ 3 21 | 12 45 | ♉ 10 04 | ♎ 3 30 | ♍ 8 15 |
| 250 | 18 57 | 13 47 | 23 07 | 20 41 | 13 34 | 19 03 |
| 260 | 29 02 | 24 00 | ♋ 3 18 | ♊ 0 57 | 23 36 | 29 03 |
| 270 | ♎ 9 04 | ♎ 4 01 | 13 20 | 10 54 | ♍ 3 37 | ♎ 8 21 |
| 280 | 19 01 | 13 50 | 23 12 | 20 33 | 13 36 | 17 03 |
| 290 | 28 55 | 23 29 | ♌ 2 54 | 29 54 | 23 34 | 25 16 |
| 300 | ♏ 8 46 | ♏ 2 57 | 12 27 | ♋ 9 01 | ♐ 3 30 | ♏ 3 04 |
| 310 | 18 33 | 12 17 | 21 53 | 17 54 | 13 25 | 10 31 |
| 320 | 28 18 | 21 29 | ♍ 1 13 | 26 36 | 23 19 | 17 43 |
| 330 | ♐ 8 01 | ♐ 0 34 | 10 26 | ♌ 5 10 | ♍ 3 13 | 24 42 |
| 340 | 17 41 | 9 36 | 19 36 | 13 37 | 13 05 | ♐ 1 32 |
| 350 | 27 21 | 18 24 | 28 43 | 22 00 | 22 57 | 8 16 |

*Quomodo Tabula præcedens tépori futuro accommodetur.*

IN 100 annis Aphelia & Nodi Planetarum progrediuntur, ut in adjunctâ Tabellâ.

How to make the præcedent Table serve for times to come.

IN 100 *years, the Aphelia and Nodes of the Planets move forward thus much,*

| | Aphelia | Nodis |
|---|---|---|
| *Earth* | 1, 712 | |
| *Saturn* | 2, 102 | 1, 985 |
| *Jupiter* | 1, 311 | 0, 097 |
| *Mars* | 1, 860 | 1, 104 |
| *Venus* | 2, 168 | 1, 306 |
| *Mercur.* | 2, 912 | 2, 368 |

K

Per hos numeros Tabulæ præcedentes (ad annum 1673 completum conſtructæ) ad alium quemlibet adaptari poſſunt. Tabulæ iſtæ notatæ C (quas ſolummodò intelligo) prout nunc ſunt ad annum 1700 inſervient. Poſt periodum iſtam adimpletam ad annum 1730 ad 30 (ſcilicet) annos ſequentes accommodari poſſunt, & tunc ad 1760 fœliciter inſervient. Nam in 30 annis Nodi progreſſum faciunt adjunctæ tabulæ, qui in eruendis Latitudinibus non cauſabit errorem plus $\frac{1}{8}$ gr. in ipſis *Marte* & *Venere* ubi error erit maximus.

| | |
|---|---|
| ♄ | 36′ |
| ☊ | 02 |
| ♂ | 23 |
| ♀ | 23 |
| ☿ | 43 |

Repeto igitur has Tabulas notatas C, factas eſſe ad 1763 completum quas ſi deſideras rectificare ad annum 1730 completum. Primo ſume differentiam horum annorum (ſc.) 57, & in hunc numerum duc progreſſus Aphelios Tabulæ K. Abſciſſis quinque dextimis figuris reſiduum erit gradus. Fractio decimales graduum partes, quæ in ſexageſimas facile converti poſſunt. Et deinde numeri ſic inventi addendi ſunt numeris Planetarum reſpectivis in Tabula C, atque ita ad annum 1730 rectificantur.

Eodem

*And by theſe numbers, the Tables precedent (which are made to the year 1673 complet) may be fitted to any year to come. For theſe ſaid Tables (thoſe noted with* C, *I onely ſpeak of) as they now are, will ſerve till the year* 1700. *And afterwards they may be fitted to* 1730; *that is, for* 30 *years to come, after that period of time, and ſo they will ſerve in uſe till* 1760 *very well. For in* 30 *years the Nodes make this progreſſe onely, which in their latitudes will not erre above* $\frac{1}{8}$ *of a degree, no not in* Mars *and* Venus, *in which two Planets this errour muſt be greateſt.*

| | |
|---|---|
| ♄ | 36′ |
| ☊ | 02 |
| ♂ | 23 |
| ♀ | 23 |
| ☿ | 43 |

*I ſay theſe tables noted with* C, *are made for the year* 1673 *complete. And if you would rectifie them to the year* 1730 *complete, you are firſt to take the difference of theſe two years,* 1673 *and* 1730, *which will be* 57: *and by* 57 *multiply the Aphelial numbers or progreſſes at* K, *and from the product cut off the* 5 *laſt figures; the remainder ſhall be the degrees, and the fraction ſhall be the decimal parts of degrees, which will eaſily be turned into ſexageſimal parts. And then the number ſo found out for each Planet, muſt be added reſpectively to every number of his proper Planet in the precedent Table*

C:

Eodem modo rectificabis Nodorum loca multiplicando per 57 motum eorum in Tabula K, ut antè correctio deindè cuique Planetæ reſpective eſt addenda juxta motum in Tabulâ M expreſſum.

C: *and ſo the numbers of that Table ſhall be rectified for the year* 1730.

*In the ſame manner you may rectifie the places of the Nodes by multiplying the former numbers of the Nodes motion at* K, *into* 57, *&c. as before. Then the corrections muſt be added to each Planet reſpectively according as the places of their Nodes are expreſſed in the Table* M.

## M

| | | d. | ′ | |
|---|---|---|---|---|
| Aphelia Planetarum ad An. 1673. | *Earth* | 6 | 59 | *Cancer* |
| | *Saturn* | 27 | 30 | *Sagit.* |
| | *Jupiter* | 7 | 49 | *Libra* |
| *The Aphelia of the Planets ſtand thus in* 1673. | *Mars* | 0 | 21 | *Virgo* |
| | *Venus* | 2 | 49 | *Aqua.* |
| | *Mercury* | 14 | 57 | *Sagit.* |

Aphelia, & Nodii (rigidè ſumpti) non ſunt fixi ſed continuo moventur minimò ſpatio. Interim quia motus eſt tardiſſimus (quòd ad hoc Inſtrumentum) abſque notabili errore per aliquot annorum ſpatium fixâ imaginemur.

Error enim oriens ex Nodis fixis in annis 30, non excedit 8 min. ſcrupula prima in ipſis *Marte* & *Venere*, ut anteà monſtratum. Error etiam ex fixis Apheliis in 30 annorum curſu erit circiter 31 min. in Terra vel Sole, 38 min. in *Saturno*, 24 min. in *Jove*, 33 m. in *Marte*, 39 min. in *Venere*, 52 min. in *Mercurio*. Error ſanè in his Inſtrumentis ſatis tolerabilis.

## M

| | d. | ′ | | |
|---|---|---|---|---|
| *Cancer* | 22 | 27 | *Saturn* | Nodi Plan. Aſcendentes ſic ſtant Anno 1673. |
| *Cancer* | 5 | 30 | *Jupiter* | |
| *Taurus* | 17 | 33 | *Mars* | *The Aſcend. Nodes of the Plan. ſtand thus in* 1673. |
| *Gemini* | 13 | 58 | *Venus* | |
| *Taurus* | 14 | 09 | *Mercu.* | |

*The Aphelia, and Nodes ought not to ſtand ſtill (in rigour) but to move continually ſome ſmall quantity. Yet becauſe theſe motions are very ſlow, they may be permitted to ſtand ſtill for ſome number of years without much prejudice to theſe Planetary Inſtruments.*

*The errour of Latitude wch ariſeth from the immobility of the Nodes, is in* 30 *years (even in* Mars *and* Venus) *not above* 8 *minutes, as was ſhewed before. And the errour in Longitude, which ariſeth by reaſon of the immobility of the Aphelia, will in* 30 *years time be about* 31 *minutes in the* Earth *or* Sun; 38 *min. in* Saturn; 24 *min. in* Jupiter; 33 *m. in* Mars, 39 *min.*

39 *min. in* Venus; 52 *min. in* Mercury; *which may well be endured in these mannuary Theorics.*

| N | | | gr. | ′ | | N |
|---|---|---|---|---|---|---|
| | Maximæ Planetarum Inclinationes. | *Saturn* | 2 | 32 | *The Planets greatest Inclinations.* | |
| | | *Jupiter* | 1 | 19 | | |
| | | *Mars* | 1 | 50½ | | |
| | | *Venus* | 3 | 22 | | |
| | | *Mercury* | 6 | 54 | | |

Distantia Apheliorum dividendæ sunt per numeros cuique Planetæ in Tabula H adjunctos, ultra Centrum in iisdem partibus quousque opus fuerit continuandæ. Sic distantiam *Solis* à *Terrâ* comparaveris in Semidiametris *Terræ*. Si primò, in propriâ cuique Planetæ scalâ mensuraveris, & secundò, si *Saturni* distantiam multiplicaveris in 400, *Jovis* in 200, *Martis* in 100, *Veneris*, *Mercurii*, & *Terræ* in eâdem, cum illis Tabula per 50 numeros facile ob eorum proportionem subduplam in memoriâ retinueris.

*Let the Aphelial distances be divided into these numbers here set to every Planet, and continued in the same parts beyond the Center, so farre as is needfull. So shall their distances from the Earth and the Sun be had in semidiameters of the Earth; If first they be measured upon their proper scales: and secondly, if* Saturns *distance be multiplyed by* 400; Jupiters *by* 200, Mars *his distance by* 100; Venus, Mercury *and the* Earth *upon the same side with them by* 50. *Which numbers may be easily remembred, because they goe in a subduple proportion.*

H

| | |
|---|---|
| *Saturn* | $85\frac{36}{100}$ |
| *Jupiter* | $92\frac{87}{100}$ |
| *Mars* | $56\frac{73}{100}$ |
| *The Earth* | $69\frac{38}{100}$ |

## R

*Fitted to just 40 degrees.*

| | gr. | ′ |
|---|---|---|
| 1 | 3 | 39 |
| 2 | 7 | 19 |
| 3 | 11 | 01 |
| 4 | 14 | 46 |
| 5 | 18 | 36 |
| 6 | 22 | 32 |
| 7 | 26 | 35 |
| 8 | 30 | 49 |
| 9 | 35 | 16 |
| 10 | 40 | 00 |

## Q

*Fitted to 60 degrees*

| | gr. | ′ | | gr. | ′ |
|---|---|---|---|---|---|
| | 1 | 14 | | 26 | 59 |
| | 2 | 28 | | 28 | 23 |
| | 3 | 42 | | 29 | 48 |
| 1 | 4 | 57 | 6 | 31 | 15 |
| | 6 | 12 | | 32 | 43 |
| | 7 | 27 | | 34 | 12 |
| | 8 | 42 | | 35 | 43 |
| 2 | 9 | 57 | 7 | 37 | 15 |
| | 11 | 12 | | 38 | 49 |
| | 12 | 28 | | 40 | 26 |
| | 13 | 44 | | 42 | 05 |
| 3 | 15 | 01 | 8 | 43 | 48 |
| | 16 | 18 | | 45 | 34 |
| | 17 | 36 | | 47 | 23 |
| | 18 | 54 | | 49 | 15 |
| 4 | 20 | 13 | 9 | 51 | 10 |
| | 21 | 33 | | 53 | 10 |
| | 22 | 53 | | 55 | 27 |
| | 24 | 14 | | 57 | 33 |
| 5 | 25 | 36 | 10 | 60 | 00 |

*This Table is to devide the Oval in the Theorics, out of the equally divided 3 degrees.*

| | gr. | ′ |
|---|---|---|
| 2 | 0 | 10 |
| 4 | 0 | 20 |
| 5 | 0 | 25 |
| 6 | 0 | 30 |
| 8 | 0 | 39 |
| 10 | 0 | 49 |
| 12 | 0 | 58 |
| 14 | 1 | 07 |
| 15 | 1 | 12 |
| 16 | 1 | 16 |
| 18 | 1 | 24 |
| 20 | 1 | 32 |
| 22 | 1 | 40 |
| 24 | 1 | 48 |
| 25 | 1 | 51 |
| 26 | 1 | 54 |
| 28 | 2 | 00 |
| 30 | 2 | 06 |
| 32 | 2 | 21 |
| 34 | 2 | 16 |
| 35 | 2 | 14 |
| 36 | 2 | 20 |
| 38 | 2 | 23 |
| 40 | 2 | 25 |
| 42 | 2 | 27 |
| 44 | 2 | 28 |
| 45 | 2 | 28½ |

W

| Maxima obliquitas Ecliptiæ. | deg. | ′ | |
|---|---|---|---|
| | 23 | 31½ | |
| | 23 | 31 | |
| | 23 | 30 | |

| Maxima reductio | deg. | ′ | ″ |
|---|---|---|---|
| | 2 | 29 | 06 |
| | 2 | 28 | 59 |
| | 2 | 28 | 45 |

W

| | gr. | ′ |
|---|---|---|
| 46 | 2 | 29 |
| 48 | 2 | 28 |
| 50 | 2 | 27 |
| 52 | 2 | 26 |
| 54 | 2 | 23 |
| 55 | 2 | 22 |
| 56 | 2 | 20 |
| 58 | 2 | 16 |
| 60 | 2 | 12 |
| 62 | 2 | 06 |
| 64 | 2 | 00 |
| 65 | 1 | 57 |
| 66 | 1 | 54 |
| 68 | 1 | 47 |
| 70 | 1 | 39 |
| 72 | 1 | 31 |
| 74 | 1 | 22 |
| 75 | 1 | 17 |
| 76 | 1 | 13 |
| 78 | 1 | 03 |
| 80 | 0 | 53 |
| 82 | 0 | 43 |
| 84 | 0 | 32 |
| 85 | 0 | 27 |
| 86 | 0 | 22 |
| 88 | 0 | 11 |
| 90 | 0 | 00 |

*Epochæ.* ANOMALIÆ *Epochæ.*

| *Ad Annos* | *Terræ Epochæ* | *Saturni Epochæ* | *Jovis Epochæ* | *Martis Epochæ* | *Veneris Epochæ* | *Mercur Epochæ* |
|---|---|---|---|---|---|---|
| 1644 | 194 80 | 119 90 | 229 28 | 299 78 | 238 78 | 61 55 |
| 52 | 194 72 | 217 62 | 112 08 | 30 97 | 240 15 | 139 27 |
| 60 | 194 64 | 315 33 | 354 88 | 122 15 | 241 53 | 216 90 |
| 68 | 194 57 | 53 04 | 237 68 | 213 34 | 242 91 | 294 71 |
| 76 | 194 49 | 150 75 | 120 48 | 304 52 | 244 29 | 12 42 |
| 84 | 194 41 | 248 46 | 3 28 | 35 71 | 245 67 | 90 14 |
| 92 | 194 34 | 346 17 | 246 08 | 126 89 | 247 04 | 167 86 |
| 100 | 194 26 | 83 88 | 128 88 | 218 08 | 248 42 | 245 58 |

*Ad Meridiem primi diei Januarii, sub Meridiano* LONDINI.

Hæ Epochæ uti nunc sunt durabunt ad 1700, & ulterius ab 8 in 8 annos continuabuntur hoc modo. Ab ultimâ Terræ Epochâ subducatur numerus Terræ affixus in Tabulâ adnexâ, *viz.* 0. 077, in reliquis Planetis ultimis eorum Epochis numeri affixi prout Tabula monstrabit sunt addendi Tabulæ motuum sequentes nullâ indigent correctione, correctis enim Epochis nihil amplius restat corrigendum.

*These Epochaes do endure till* 1700. *If it be required to continue them further for every* 8 *years, then from the last Epocha of the Earth must be subtracted the number here standing by the Earth, namely,* 0. 077; *and in all the other Planets the numbers here set down must be added to the last Epocha of each of them standing in the superiour Table of Epochaes. All the correction that is requisite is to be done in the Epochaes, in the rest of the Tables of motions, which now follow, there will be no need of any such things.*

| | | | | |
|---|---|---|---|---|
| Pro singulis annis. | *Earth* | 000 . 077 | Subtr | *For every* 8 *years.* |
| | *Saturn* | 097 . 711 | Adde | |
| | *Jupiter* | 242 . 800 | Adde | |
| | *Mars* | 091 . 186 | Adde | |
| | *Venus* | 001 . 377 | Adde | |
| | *Mercury* | 077 . 719 | Adde | |

Motus

## MOTUS ANOMALIÆ.

| *In annis* | *Earth* | ♄ | ♃ | ♂ | ♀ | ☿ |
|---|---|---|---|---|---|---|
| 1 | 359.74 | 12.21 | 30.33 | 191.27 | 224.27 | 53.69 |
| 2 | 359.49 | 24.41 | 60.66 | 22.53 | 89.54 | 107.38 |
| 3 | 359.23 | 36.62 | 90.99 | 213.80 | 314.32 | 161.08 |
| 4 | 359.69 | 48.86 | 121.40 | 45.59 | 180.69 | 218.86 |
| 5 | 359.71 | 61.06 | 151.73 | 236.86 | 45.46 | 272.55 |
| 6 | 359.45 | 73.27 | 182.06 | 68.13 | 270.23 | 326.24 |
| 7 | 359.19 | 85.47 | 212.39 | 259.39 | 135.00 | 19.93 |

### *In Menſibus Anni Communis.*

| | *Earth* | ♄ | ♃ | ♂ | ♀ | ☿ |
|---|---|---|---|---|---|---|
| *Janu.* | 30.55 | 1.04 | 2.58 | 16.24 | 49.67 | 126.86 |
| *Febr.* | 58.15 | 1.97 | 4.90 | 30.72 | 94.52 | 241.45 |
| *Mart.* | 88.70 | 3.01 | 7.48 | 47.16 | 144.19 | 8.31 |
| *April.* | 118.27 | 4.01 | 9.97 | 62.88 | 192.25 | 131.08 |
| *Maj.* | 148.03 | 5.05 | 12 55 | 79.13 | 241.92 | 257.94 |
| *Jun.* | 178.59 | 6.05 | 15.04 | 94.85 | 289.98 | 20.71 |
| *Jul.* | 208.95 | 7.09 | 17.62 | 111.09 | 339.65 | 147.57 |
| *Aug.* | 239.50 | 8.13 | 20.19 | 127.34 | 29.31 | 274.43 |
| *Sept.* | 269.07 | 9.23 | 22.68 | 143.06 | 77.38 | 37.20 |
| *Octob.* | 299.62 | 10.17 | 25.26 | 159.30 | 127.04 | 164.06 |
| *Nov.* | 329.19 | 11.17 | 27.75 | 175.02 | 175.11 | 286.83 |
| *Dec.* | 359.74 | 12.21 | 30.33 | 191.27 | 224.77 | 53.69 |

### *In Menſibus Anni Biſſextilis.*

| | *Earth* | ♄ | ♃ | ♂ | ♀ | ☿ |
|---|---|---|---|---|---|---|
| *Jan.* | 30.55 | 1.04 | 2.58 | 16.24 | 49.67 | 126.86 |
| *Febr.* | 59.14 | 2.01 | 4.99 | 31.44 | 96.13 | 245.54 |
| *Mart.* | 89.69 | 3.04 | 7.56 | 47.69 | 145.79 | 12.40 |
| *April.* | 119.26 | 4.05 | 9.95. | 63.41 | 193.86 | 135.17 |
| *Maj.* | 149.81 | 5.08 | 12.63 | 79.65 | 243.52 | 262.03 |
| *Jun.* | 179.38 | 6.09 | 15.12 | 95.37 | 291.58 | 24.80 |
| *Jul.* | 209.93 | 7.12 | 17.70 | 111.62 | 341.25 | 151.66 |
| *Aug.* | 240.49 | 8.16 | 20.27 | 127.86 | 30.92 | 278.52 |
| *Sept.* | 270.05 | 9.16 | 22.77 | 143.58 | 78.98 | 41.29 |
| *Octo.* | 300.61 | 10.20 | 25.34 | 159.83 | 128.64 | 168.15 |
| *Nov.* | 330.18 | 11.20 | 27.84 | 175.55 | 176.71 | 290.92 |
| *Dec.* | 360.73 | 12.24 | 30.41 | 191.79 | 226.37 | 57.78 |

## MOTUS ANOMALIÆ.

| In dieb. | Earth | ♄ | ♅ | ♂ | ♀ | ☿ |
|---|---|---|---|---|---|---|
| 1 | 0.99 | 0.03 | 0.08 | 0.52 | 1.60 | 4.09 |
| 2 | 1.97 | 0.07 | 0.17 | 1.05 | 3.20 | 8.18 |
| 3 | 2.96 | 0.10 | 0.25 | 1.57 | 4.81 | 12.28 |
| 4 | 3.94 | 0.13 | 0.33 | 2.10 | 6.41 | 16.37 |
| 5 | 4.93 | 0.17 | 0.24 | 2.62 | 8.01 | 20.46 |
| 6 | 5.91 | 0.20 | 0.50 | 3.14 | 9.61 | 24.55 |
| 7 | 6.90 | 0.23 | 0.58 | 3.67 | 11.21 | 28.65 |
| 8 | 7.88 | 0.27 | 0.66 | 4.19 | 12.82 | 32.74 |
| 9 | 8.87 | 0.30 | 0.75 | 4.72 | 14.42 | 36.83 |
| 10 | 9.86 | 0.33 | 0.83 | 5.24 | 16.02 | 40.92 |
| 11 | 10.84 | 0.37 | 0.91 | 5.76 | 17.62 | 45.02 |
| 12 | 11.83 | 0.40 | 1.00 | 6.29 | 19.23 | 49.11 |
| 13 | 12.81 | 0.43 | 1.08 | 6.81 | 20.83 | 53.20 |
| 14 | 13.80 | 0.47 | 1.16 | 7.34 | 22.43 | 57.29 |
| 15 | 14.78 | 0.50 | 1.25 | 7.86 | 24.03 | 61.38 |
| 16 | 15.77 | 0.53 | 1.33 | 8.38 | 25.63 | 65.48 |
| 17 | 16.76 | 0.57 | 1.41 | 8.91 | 27.24 | 69.57 |
| 18 | 17.74 | 0.60 | 1.50 | 9.43 | 28.84 | 73.66 |
| 19 | 18.73 | 0.63 | 1.58 | 9.96 | 30.44 | 77.75 |
| 20 | 19.71 | 0.67 | 1.66 | 10.48 | 32.04 | 81.85 |
| 21 | 20.70 | 0.70 | 1.75 | 11.00 | 33.64 | 85.94 |
| 22 | 21.68 | 0.73 | 1.83 | 11.53 | 35.25 | 90.03 |
| 23 | 22.67 | 0.77 | 1.91 | 12.05 | 36.85 | 94.12 |
| 24 | 23.65 | 0.80 | 1.99 | 12.58 | 38.45 | 98.22 |
| 25 | 24.64 | 0.83 | 2.08 | 13.10 | 40.05 | 102.31 |
| 26 | 25.63 | 0.87 | 2.16 | 13.62 | 41.66 | 106.40 |
| 27 | 26.61 | 0.90 | 2.24 | 14.15 | 43.26 | 110.49 |
| 28 | 27.60 | 0.93 | 2.33 | 14.67 | 44.86 | 114.58 |
| 29 | 28.58 | 0.97 | 2.41 | 15.20 | 46.45 | 118.68 |
| 30 | 29.57 | 1.00 | 2.49 | 15.72 | 48.06 | 122.77 |
| 31 | 30.55 | 1.04 | 2.58 | 16.24 | 49.67 | 126.86 |

Sic tandem absolvimus omnes Tabulas his Theoricis necessarias ad colligendas æquales sive medias Anomalias in cujusque diei Meridie. Quomodo autem concinne inscribantur in Instrumentis, & unaquæque affixa Orbitæ, propriæ Planetæ convenientissimè disponatur ad usum, absque reliqui operis impedimento in schematibus videre est.

*These are all the Tables that are to be set upon the Theorical plates, whereby the equal or Mean Anomalyes may be gathered to any day at Noon. The manner how they are to stand upon the two Plates with such convenience that they may be ready for use, annexed each to the proper Orbit of its own Planet, without hindrance of the other work that is there drawn, may best be seen upon my Theorics.*

FINIS.